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Boards of Conciliation and Arbitration.

The following is extracted and condensed from a paper read February 16, 1871 by ECKLEY B. COXE, Esq., before the Social Science Association of Philadelphia:

I wish to speak this evening with special reference to the amicable adjustment of the wages question, so as to do away with the present unsettled state of the anthracite coal trade in Pennsylvania. It would perhaps be proper for me to state here, in addition, that I am at present engaged as an operator in mining anthracite coal, and that consequently my views may not be so impartial as I should wish them to be; but any of my hearers, whose opinions may differ from those expressed in the sequel, will, I trust, make allowance for the difficulty experienced by one in my position when endeavoring to make an unbiassed exposition of the state of the case.

The first point to which I would direct your attention is the unsatisfactory (it would perhaps not be too strong an expression to say *barbarous*) manner in which the disputes arising so constantly between employers and *employés* in regard to wages, to the hours of labor, etc., are now generally settled. Let us take, for the purpose of simplifying our discussion, the case of a single mine or manufactory, reserving the question of the combination of all the workmen in a trade for another part of the paper.

If the demand for the article manufactured at the establishment increases, so as to cause either an advance in the price or larger sales of the product, or a combination of the two, the employer is naturally anxious to supply this demand, and is, therefore, obliged not only to keep all his old hands busy, but also to endeavor to obtain new ones. The *employés*, knowing that business is very active, and feeling that the proprietor of the factory is anxious to lose no time and that he is making money, seize upon this opportunity to make a demand for increased pay, either in the form of additional wages or in that of a diminution of the hours of labor. The same thing may occur when the demand for labor in other trades makes workmen scarce.

Under either of the above circumstances the operatives feel that they are not likely to be discharged, as their services are very much needed, and at the same time they know that they can easily find work elsewhere, if that should happen. If, on the other hand, the employer finds that the sales of his commodities are decreasing, that prices are falling, or that trade generally is dull, and, therefore, the number of laborers seeking employment is increasing, he is induced to offer less wages than he has been paying to his hands, as he feels satisfied that they will accept the smaller amount rather than risk losing their places and having them filled by some of those who have been thrown out of employment by the general depression of the trade. There is no doubt that the above circumstances would often justify one party in demanding more and the other in giving less, and, if both were infinitely wise and honest, no difficulty would occur. Such, however, is not the case; both parties are prone to take a very prejudiced view of the matter in question. The employer is too apt to imagine that he is paying too much, that men could be got for less wages, or that he is not making enough profit; and, on the other hand, the workmen are generally inclined to consider themselves very badly treated, to think their wages much lower than their employer could really afford, or that by a sudden strike they could force him to give an advance. Both parties generally make their demands more exorbitant than they otherwise would do, in order to have a margin for compromising, as they express it. The result of such an exorbitant demand is but too often a surly and defiant answer, followed in many cases by a strike or lockout. The only method at present in vogue in this country for settling such disputes is the barbarous one of resorting to force; that is, each party seeks to starve the other out. The employer hopes that, by stopping the works for some time, he will prevent the men from earning a livelihood, and that they will finally be compelled by hunger and want to accept his terms. The men, on the contrary, hope to be able to remain idle so long that their employer will be compelled to accede to their demands, in order to avoid great loss or total ruin. On the one side, bankruptcy stares the manufacturer in the face; on the other, starvation the workmen. When the workmen in any branch of industry have combined together and formed a trade union, the strikes, instead of being confined to a single establishment, generally extend to several; and they are almost always longer and more determined, as the operatives who are idle are supported by those who are working, or by the reserve fund of the trade union. This sketch of the manner in which strikes generally originate, and of the way in which they are often settled, although very brief and imperfect, will suffice for the purpose for which I have introduced it.

If we pause to reflect upon this method of settling the difficulties which arise between two parties who are so dependent upon each other for their support as the capitalist and the laborer are, we find it difficult to realize that it is the one most in vogue in a civilized community and in the nineteenth century. If we were relating the history of some savage or half-civilized tribe, in which the old doctrine of "might is right" still retained undisputed sway, we should not excite the astonishment of our hearers by relating how employers had starved their operatives into submission, or how the workmen had restorted to intimidation, incendiarism, and even to murder, in order to frighten their employers into acceeding to their demands.

Fortunately, however, the prospect is not so dreary in all directions; here and there bright spots are visible upon the clouded horizon, which give promise of better days; there are a few oases upon the great desert of strife between capital and labor. The Boards of Reconciliation and Arbitration, which have been introduced of late years with such great success in some parts of England, have roused the hopes of all true friends, not only of the workingman, but of humanity, and have encouraged them to look forward to an amicable and just settlement of this vexed question of capital and labor. The person, to whom, undoubtedly, the greatest credit is due for having first practically employed them for the purpose of doing away with strikes in England, is Mr. A. J. MUNDELLA, whose remarks upon this subject and upon that of education were listened to with so much attention at the last general meeting of the American Social Science Association, held in this city, His views on this subject are worthy of careful consideration, as he was at one time a workman himself, and is now one of the largest employers of labor in England. Could any one familar with the suffering, the crime, the destruction of property, and the loss of national wealth occasioned by the strikes which have so often occurred of late years in the anthracite coal fields of our State, listen without a feeling of pleasure and relief to his clear and concise statements of the results of the establishment of the first Board of Arbitration for the lace and hosiery trades at Nottingham, England? I remember so well the general tenor of his remarks. "Gentlemen," he said, "eleven years ago we had, in the above-mentioned trades, about three strikes every year; since the introduction of the Board of Arbitration, which occurred at about that time, we have never lost half a day by a strike, the men have never been so well off, the mill-owners have never done better. This system has been tried with equal success in the Staffordshire potteries, the Cleveland iron districts, and several other places in England; it has been successful wherever an honest effort was made to introduce it." These facts are sufficient, I think, to convince us that Boards of Arbitration are well worthy of a trial, or, at least, of being carefully studied and discussed.

I now propose to examine for a few minutes the principles upon which they are founded, the manner in which they work in practice, and the good results which we may reasonably expect from them, if introduced into our coal-fields. I shall consider the subject under three heads, viz: What are Boards of Conciliation and Arbitration? What objections are generally made to them, not only by the *employés*, but also by the employer? What good results may we hope to obtain by adopting them? I shall hereafter use the expression, "*Boards of Arbitration*," instead of "*Boards of Conciliation and Arbitration*," as the latter is too long to be repeated very often; but we must never forget that it is conciliation which plays the principal rôle in this system of settling disputes.

Let us now consider the first question, *What is arbitration?* The object of Boards of Arbitration is to substitute for the old method of forcing one party to yield, through fear of ruin or starvation, to the demands of the other, be they just or unjust, the more rational one of discussing the wages question periodically and amicably, and endeavoring to harmonize the views of both parties by mutual concessions, or, failing in that, to call in an umpire or impartial third party, whose decision is to be submitted to by both parties. This is the theory; let us now see how it is carried out in practice. When any trade has agreed to adopt this institution, at the beginning of each year both the employers and employés select, by election, a certain number of their fellows—say six, eight or ten—from each party, to represent them in the Board. Let us suppose that each party has selected ten delegates. At the beginning of the trade year, these twenty men meet together and organize the Board by electing a president and vice-president; one of these officers is generally taken from the employers and the other from the employés. A secretary is also chosen, who may or may not be a salaried officer, and who acts as clerk to the Board, notifies the different parties interested as to their decisions, and performs such other duties as may be required of him by that body. He need not be a member, as his functions are simply clerical. The first business which comes before the Board after it has been organized is the selection of an umpire, and this is one of the most important acts of that body. It is very important that this election should take place before any question has been discussed or any attempt is made to settle a dispute, as it will be much easier for them to agree upon a suitable person, if the election takes place before the parties have had their passions aroused by a discussion. It is very desirable, at least in my opinion, that the person selected should not be interested in any way, either as employer or employé, in the trade in question. In fact his decision would probably give greater satisfaction if he was wholly unacquainted with it. It is very difficult for any one who has been a master or workman to divest himself of the prejudices of his class; and, on the other hand, from too great an anxiety to be impartial, he may be unjust to the very person whom his feelings would naturally lead him to favor. Both the employers and the workmen would feel better satisfied with a decision of an umpire who had never belonged to either party; and, as we shall see further on, the questions to be decided by him require generally judicial rather than technical knowledge.

The members first try conciliation, and in most cases that method is successful. If they find that at first their views differ widely, they postpone voting on the question until the last moment, both parties being unwilling to resort to the umpire, partly because a decision of the Board, without his intervention, is always more satisfactory to all concerned, and partly because neither party feels sure that he will decide in their favor. This is the great advantage of having an umpire—it prevents one side from refusing to listen to reason, and retiring behind an "I will" or "I won't," If, however, conciliation fails, arbitration is resorted to, that is, the services of the umpire are called into requisition; but even when he arrives, the matter is not submitted to him at once for his decision. He, too, tries conciliation. The members representing the two sides meet together in his presence and argue the question, very much as they would before a court of justice, those members demanding an advance or reduction first stating their case. Now the fact that both sides have agreed to abide by the decision of the umpire in the event of a non-agreement, has a tendency to make both contestants anxious for an amicable adjustment of the difficulty. Each one naturally asks himself, "am I altogether right?" "would an unprejudiced person look at this matter as I do?" "is it likely that the umpire will decide against me?" etc. And, unless the answers to these questions are perfectly satisfactory, he will probably be inclined to make some concessions, rather than run the risk of having a decision rendered against him. When the party making the demand has stated his case, supporting it by various kinds of evidence, such as abstracts from the books of those engaged in the business, by reports of the markets, evidence of witnesses, etc., the other side is called upon to make their reply, in which they are allowed to correct any misstatement of fact in the evidence produced by their opponents, and to offer evidence to sustain the position they have taken in refusing to accede, either in part or altogether, to the demand made upon them. The umpire, whose duty and desire should be rather to promote harmony than to make an arbitrary decision, would endeavor to point out to each party the weak points in their own reasoning, and the strong ones in that of their opponents, a missatement of facts by any person in argument being, of course, corrected by one of the delegates representing the other view. If, however, all efforts to arrange the dispute amicably should fail, the umpire would be called upon for his decision. Such cases have been found to occur very rarely in England, where this system has been tried for a number of years. It is very important that not only the umpire, but also the members of the Board, should remember that conciliation is always to be tried before arbitration, properly so called, is resorted to. The representatives of the two parties should meet as two merchants do, when one wishes to purchase what the other has to sell, and there is certainly no reason why the members of the Board, in dealing with each other, should not use the same courtesy as they would do in their ordinary business relations. When the difficulty has been adjusted, both parties should feel that they had made a fair bargain, which was perfectly understood by all concerned, and which they all intended to carry out honestly. Such, however, is not the case, when a strike has been brought to an end by our present method of settling such difficulties; the party who yields, through fear of ruin or starvation, mentally resolves to have his revenge as soon as he has an opportunity.

Let us now consider the objections generally made to Boards of Arbitration, not only by employers, but also by the workmen. Many of the former, when the idea of submitting their disputes with their operatives to such a body is first suggested to them, cry out at once, "We will have nothing to do with it;" "we will have no interference in our business;" "we will not allow our workmen to dictate to us;" "we do not wish any

irresponsible body to come between us and our employees;" or, "we have no means of compelling the men to abide by the decision of the board, if it is against them." The real reason, however, is, that the employer's first feeling is that it is beneath his dignity to treat with his workmen as he would with any other party from whom he purchases or to whom he sells. When this prejudice has been overcome, the greatest difficulty in the way of the successful introduction of Boards of Arbitration will have been surmounted. The popularity of the brute-force method of settling the wages question is on the wane, and purchasers of labor are gradually becoming more impressed with the advantage of adopting the conciliatory method in some form. Another objection, which has great weight with many persons, is the idea that it would be almost impossible for the workingmen selected as members of the Board to understand the true principles of trade and of political economy, and that it would, therefore, be very difficult to get them to act intelligently in reference to any matter in dispute; that they would always demand more wages and never submit to a reduction. Such has not been found to be the case in practice; for, after having been for a short time a member of a Board, an operative will generally understand the state of the trade as well as his employer, and will take as practical and intelligent a view of any question in dispute as the latter.

We now come to the consideration of the objections which are made by those who suppose themselves to be acting in the interest of the workingman. They say, in the first place, that the employers being men of education, and knowing the secrets of the trade, will always be able to overreach the less well-informed representatives of the operatives in the Board. One answer to this objection is to be found in the remark of Mr. MUNDELLA, that in carrying out the arbitration scheme in England, it was found that the workmen were fully as shrewd as the employers. There is, however, another, which I think is equally satisfactory; it is this: that it is not the interest of the employers to overreach their workmen in any way in the Board, for the moment the men feel that they have been deceived, or that advantage has been taken of their ignorance to obtain a decision against them, they will become dissatisfied with the Board and refuse to obey its orders. Another objection is, that the employers, being richer, might bribe the umpire to decide in their favor. This objection has never, I believe, been very seriously urged: for it is so obviously the interest of the employer to avoid doing any thing calculated to lead the men to distrust the impartiality of the umpire or the fairness of the decisions of the Board, that any such attempt would not be likely to be made. If, however, the umpire is chosen before any subject is discussed, and if care is taken to select some one in no way interested in the trade, and well known for probity and intelligence, both parties would feel satisfied that his decisions were dictated by a desire to do justice to all concerned.

The only other objection which I shall consider here is the following: that Boards of Arbitration would break up trade unions, and would, therefore, eventually leave the operatives without any organization to protect themselves from their employers, in case the latter refused to continue to take part in the Boards of Arbitration or to be governed by their decisions; for this reason it is assumed that their adoption would be opposed by trade unions.

The answer to this question is simple but emphatic, "Without a union of some kind, Boards of Arbitration could not be organized and kept working." The union represents the men, just as the Boards of Trade, etc., represent the operators or employers, and it is its province to see that proper persons are selected as delegates, to furnish these delegates with all necessary information as to the demands of the men, etc., as the Boards of Trade would do for the other delegates. When the Board of Arbitration has met and settled upon the rate of wages, the hours of labor, etc., the union would transmit to the different branches the resolutions adopted, and see that they were carried out by the men. It would be extremely difficult to introduce Boards of Arbitration in any district where no union of any kind existed among the workmen. Another answer to the same objection is, that Boards of Arbitration are advocated by almost every trade union in England. . . . .

Ironmasters have already begun to turn their attention to those parts of the South and West where coal, iron and limestone are found in the same vicinity, and where they can have the mines under their own control. If the present state of affairs continues, they will soon bid farewell forever to eastern Pennsylvania. Protection will not save us from such a fate. It is time that all those interested in mining and transporting coal, whether as operators, miners or railroad companies, should recognize the fact, that the present system of keeping up prices by strikes and suspensions is all wrong, and that however great the temporary benefit may be, the penalty must one day be paid in the gradual extinction of the iron and the other industries which use large quantities of anthracite coal for fuel.

But why should we not pause, and, before it is too late, make an honest effort to try these Boards of Arbitration, which promise to be of such great benefit to the miner, the operator and the transporting companies, without doing injury to any one, and whose good influence, if they should prove successful, will be felt not only in every large manufactory, but also in the humblest cottage in which anthracite is used as a fuel?

Iron-Smelting in Great Britain.

By WILLIAM B. POTTER, E. M.

PERHAPS the most interesting district in Great Britain is that known as the Cleveland district in the North Riding of Yorkshire, near the mouth of the river Tees. This name, however, now applies to the southern part of Durham as well, to which the iron industry has extended. In this section of the country, where twenty years ago there was hardly a blast-furnace or mill, and where there was nothing to be found of the bustle and excitement of business or manufacture, there has sprung up an industry which far exceeds in magnitude and importance that in any other part of Great Britain, or in fact of the world. In our own country, where we are accustomed to see such rapid and enormous strides made in the growth and development of various sections, there is nothing to compare with it. Although about the youngest iron district of the kingdom, it is by far the greatest in point of production, as well as in economical and scientific systems of working. It serves as a striking example of what can be done with comparatively poor material by the application of science and skill, and as a lesson to that class of iron-masters in this country who work very much on the put-in-at-the-top-and-take-out-at-the-bottom principle, without seeming to feel any great interest in the intermediate operations within the blast-furnace, which affect so much the character of the product, and hence the success of the enterprise itself.

During the year 1869, nearly one-third of the pig-iron produced in Great Britain, and one-sixth of that of the entire world, or 1,440,858 tons, was contributed by this district; and the yield of various preceding years will show the general rate of increase up to that date:

1854	=	348,444 tons.
1857	=	649,588 "
1860	=	658,679 "
1866	=	1,043,527 "

The number of iron-works where the Cleveland ironstone is smelted amounts to 26, and these contain 160 furnaces, of which 92 are in blast, making thus an average of about 15,660 tons for each furnace per annum.

The ore, or, as it is usually called in Great Britain, the ironstone, which may be said to be the cause of such metallurgical and engineering enterprise, is found in the Cleveland Hills, on the northeast coast of Yorkshire, near the mouth of the Tees. It occurs in the Middle Lias group of the Jurassic formation in some eight or ten seams, only one of which, the "Main Cleveland Seam," is worked to any great extent. This has a thickness of from ten to twenty feet, and in some places is split by intervening shales, etc., into two seams, known as the Avicula and Pecten seams, so called from the general occurrence of these fossils in each. These seams crop out in the cliffs and isolated hills along the coast, and incline off to the southeast at an angle of about 10° to 15°. The exact limits of these beds inland have not yet been determined, but the best authorities give 420 square miles as the probable dimensions of the field. It is estimated that the "Main Cleveland Seam" yields on an average 20,000 tons to the acre; so that the supply yet to be mined from it is not far from 5,000 million tons. The ore is an argillaceous carbonate, oölitic in structure, filled with immense numbers of fossils, and of a faint bluish-green color. When raw, it bears scarcely any resemblance to an iron ore, being more like an oölitic limestone, and it is probably owing to this circumstance that the ore was only so lately found in place. For many years previous to its discovery, masses, oxidized by exposure, had been found by the fishermen on the coast, and taken to the various iron-works in the river Tyne. Mr. ALLISON, in a paper on the Cleveland iron-stone, says: "Whoever was the first discoverer, the German Ocean may, we think, with justice be said to have been the first miner, by undermining and denuding the Lias cliffs of the Yorkshire coast, containing the main bed of iron-stone, strewing the sea-beach with large blocks of the ore, which, like lobsters boiled, changed their color to red, by billowy or atmospheric influence, while the shaly part of the denuded cliffs was, by the same causes, pulverized and washed away."

By analysis, this ore shows from 25 to 35 per cent. of metallic iron, from a trace to 1 per cent. of sulphur, 1 to 2.5 per cent. of phosphoric acid, and in some cases a small percentage of manganese. When calcined it is porous, of a dark yellow to red color, and contains from 40 to 45 per cent. of metallic iron.

The calcination is effected in kilns resembling limekilns very much. They are circular, generally in horizontal section, and consist of a wrought-iron shell with fire-brick lining, supported by short cast-iron pillars about four and a half feet in length, and have a height of about 50 feet, an internal diameter of 20 feet, and a capacity of not far from 12,000 cubic feet. There are three openings below, to which the ore is directed by a series of inclined plates, and at each of these openings a self-discharging apparatus is attached, which is worked by means of a lever. Air is admitted at the bottom and through a series of holes in the brickwork above each of the openings. The top of these kilns is reached by an inclined railway, with a gradient of about 1 in 40. The ore cars, provided with dropping bottoms, are pushed up this road by a locomotive, and on over the kilns, where the load is dumped by merely knocking away a catch. The ore remains in the kilns about two days, and requires but one ton of coal-slack to about 30 tons of ore. The calcined ore is run into the charging barrow, which is placed under one of the hopper openings, by simply raising the lever and using sometimes a slight iron hook to help it along. A large amount of labor is thus saved, from the fact that the ore does not require to be handled from the time it is placed in the car at the mine, but is made to fall by its own weight into the charging wagon, where it is ready to be dumped into the furnace hot from the kiln.

The form of lift used to carry these materials to the top of the furnace is either the pneumatic lift of Mr. GJERS, or the hydraulic lift of Sir WILLIAM ARMSTRONG. The former consists of a cast-iron tube made in lengths bolted together, and bored throughout. In this there is a piston with balance weight, which connects with a platform by means of wire ropes passing over large wheels at the top of the tube. A small pumping engine at the bottom of the lift, by alternately forcing air into and exhausting it from the tube below the piston, causes it to work up or down, and the platform, steadied by guides, to move in a corresponding opposite direction. The hydraulic lift consists of a double framework for two platforms, on two opposite sides of which the cylinders for the rams are fixed vertically. Attached to the head of each ram is a five-sheave block, and attached to the frame above each, a four-sheave block. Chains passing over pulleys at the top of the lift, and fastened to the platforms, move over these blocks, so that one stroke of the rams places the platforms, which work alternately, at the top or bottom. The rams have a stroke of one-tenth of the total lift, and are worked by water at a pressure of about 700 pounds per square inch.

The furnaces employed are the most remarkable in the world, and although the district is of such recent growth, there has been a very great change effected in their form and dimensions since their first introduction in 1851. At that time the average height was 42 feet, width at the boshes 15 feet, and of the hearth 6 feet, with a capacity of about 46,000 cubic feet.

In 1853 the height was increased to 56 feet, and the capacity to 72,000 cubic feet.

In 1862 the height was increased to 75 feet, and the capacity to 12,000 cubic feet.

In 1865 the height was increased to 95 feet, and the capacity to 15,000 cubic feet.

In 1868 the height was continued at 95 feet, and the capacity to 26,000 cubic feet, the diameter at the boshes being 22 feet, of the hearth 8 feet, and the throat 11 feet, with the angle of the boshes 68°. This represents the average dimensions of the furnaces now used.

In 1869 two furnaces were built, having a height of 103 feet, width at boshes equal to 27 feet, and capacity of about 33,000 cubic feet. It is now reported that a furnace is to be built with the extraordinary height of 120 feet, and a width at the bosh of 33 feet, or about three times the size of the furnaces built only twenty years ago.

The increased economy of working that has been effected within these twenty years is very great, though not entirely due to the enlarged dimensions of the furnaces, great progress having been made as well in the heating of the blast, etc. Iron masters differ very much with regard to the maximum dimensions of the blast furnace consistent with its most economical working, but Mr. ISAAC LOWTHIAN BELL, who is, without doubt, the best authority on the theory and practice of iron smelting, after a very elaborate series of experiments upon this subject, has come to the conclusion that about 25,000 cubic feet is the maximum capacity of the best class of furnaces.

The above class of furnaces consists of a wrought-iron stack lined with fire-brick, and supported upon huge brick embrasures. They are provided with closed tops, an improved form of the cup and cone arrangement, which makes a double-closed furnace-top, and prevents the escape of gases at the time of charging. It has been estimated by Mr. BELL that not far from 600,000 tons of coal are annually saved in this district by the present system of collecting the gases. These gases are taken off at the sides of the furnace, and utilized for the generation of steam and the heating of the blast.

There are various kinds of hot-blast stoves employed in the district, in some instances with the use of cast-iron pipes, and in others on the regenerative principle. A usual form is that containing flat cast-iron pipes in three rows, each having a cross section about 28×8 inches, with two short legs, which are set into the small stools composing the main—one leg into one stool and the other into the succeeding stool, and so on. The old difficulty of broken mains is thus found to be obviated. In some cases the gases, instead of being allowed to enter the stove itself, are burned in a chamber below, through openings in the top of which a steady heat is sent into the stove, and so less injury done to the pipes. There are usually eighteen pipes to a stove, which offer a total heating surface of 2,000 superficial feet, and six stoves being now generally allowed to a furnace, the area of the heating surface is equal to 12,000 feet. With these stoves a temperature of about 1000° F. is attained. In some cases the Cowper oven, on the Siemens' regenerative principle, is employed, and also a somewhat modified form of fire-brick stove, designed by a Mr. WHITWELL, which has straight flues that can be swept like a chimney; and although there is a little less heating surface, it has the great advantage that it can be cleaned without removing the bricks. These stoves have given in practice as high a heat as 1400° and even 1450° F. It is thought by many that the proper limit has not yet been reached in the temperature of the blast, and that for every 100° F. there will be a corresponding saving of 1 to 1·34 cwt. of coke per ton of iron; but such authorities as Mr. BELL hold that the lowest average figure has already been attained in the amount of coke to be used per ton of iron. Further experiments on a large scale, and additional improvements in the character of apparatus used, will without doubt in a short time determine the highest temperature to which the blast may be heated, as well as the maximum height of the blast furnace, consistent with the greatest economy in the production of pig-iron. As the case now stands, the greatest amount of fuel saved by the various improvements effected during the twenty years of smelting in this district, is 17 cwt., or nearly 50 per cent. of that originally used, as will be seen by the following comparison:

In 1851, furnaces 42 feet in height, and with blast heated at 500° F., used about 33 cwt. of coke.

In 1870, furnaces 103 feet in height, with blast heated up to 845° F., use 17 cwt. of coke. Also:

Furnaces 55 feet in height, and blast 1324° F., use 18 cwt. of coke; while

The standard furnace is now 95, with blast at 1000°, using 21 cwt. of coke.

The disposition of plant is a very effective one in this dis-

trict. Three furnaces are usually found at one establishment, though in many cases there are more, and these are placed in a row, with the lift behind the middle furnace, and platforms at the tunnel-head connecting with the other two. Of the hot-blast stoves, four are behind and two between each furnace. Back of this again, in a row, are placed the calcining kilns for the ore and limestone, and the coke-bunkers, over the top of which runs the railway, reached by an incline, as mentioned above, so that the raw materials are placed ready for use without any extra handling. Instead of one continuous pig-bed, each furnace has its own, raised about four feet above the surrounding ground, and the open space between each is used to run the slag-cars into place. These are the ordinary flat-top cars, and the frame to contain the slag is attached to the bank instead of the cars, and swings open or shut upon hinges.

The cost of production is less than in any other district of Great Britain; and the pig-irons, notwithstanding the large percentage of phosphorus they contain (from ·3 to 1·5 per cent.), are used very largely for the production of rails and plates used in shipbuilding, amounting in the case of the former to about 750,000 tons, and in the latter to nearly three-fourths of that supplied in the kingdom.—*American Chemist.*

Deep Placer Mining in California.

[Continuation.]

North Bloomfield and vicinity.—Ascending the ridge between the South and Middle Yubas, we lose the gravel range of French Corral and San Juan, which has been broken off by the Middle Yuba, and, passing over a strip of unproductive ground between San Juan and Shady Creek, we find the second or higher deposit of the "divide," which extends from Morris Flat to Cherokee, a distance of about fifteen miles, and has a width of from two to four miles, covering nearly the whole ground between the two rivers. The higher portion of this deposit has been covered with lava or volcanic ashes, and the lower portion has been worked until the outlet has been filled by the accumulated tailings, necessitating the construction of long bed-rock tunnels, to empty in either of the Yubas, before this vast extent of ground can be properly worked. An illustration of the extent of these accumulations is afforded at the crossing of Shady Creek, near Cherokee. At this point there formerly stood a saw-mill on the banks of the creek; the boilers of this mill were supplied by a water-tank which stood higher up on the bank of the stream. The tailings from above so encroached on the mill that it was rendered useless and taken down; the tank, however, remained, and the timbers of which it was composed are now seen cropping up above the tailings a distance of several inches. Another "run" will completely obliterate all traces of this landmark of early times. The depth of tailings here cannot be less than seventy feet. The towns of Cherokee and Columbia Hill are fast decaying, although surrounded with rich ground, and will never know their former prosperity till capital comes to the rescue and buys out the present owners.

Among other well-known localities are Badger and Grizzly Hills. The distance from Badger to Grizzly Hill is seven miles; a heavy gravel deposit covers the whole distance, from one to five hundred feet deep, and from one to four thousand feet in width, and, so far as developed, it is rich. There are but two places in this vast deposit (Badger and Grizzly Hills) where it can be opened to advantage. Badger and Grizzly Hills are the keys to this whole deposit. The want of capital has so far prevented its opening. The Badger Hill and Cherokee Mining Company (an incorporated concern) is now working on Badger Hill. At Columbia Hill the Union Company are running four hundred inches of water from the North Bloomfield Company's ditch with encouraging results.

North Bloomfield Gravel Mining Company.—This company is a San Francisco corporation, and is composed of some of the wealthiest residents of that city. They have acquired by location and purchase 1500 acres of mining ground, for which they are applying for a patent under the recent act of Congress. If we estimate that 1200 acres of this tract is available mining ground, with an average depth of 180 feet—and this is not too high an average—we find that this company has 348,480,000 cubic yards of auriferous dirt and gravel, of which not more than 400,000 or 500,000 cubic yards have been removed. At twenty cents per cubic yard (which is about the average yield of this region), this ground has a producing capacity of $69,600,000. In making this calculation, it will be borne in mind that while much of the surface dirt will not yield over a few cents per cubic yard—perhaps not more than enough to pay the expenses of running off—we can safely put the lower strata at twenty cents per cubic foot, or $5 40 per cubic yard. The following account of the operations of this company is taken, by permission, from the *Mining and Scientific Press* of San Francisco, to whom it was furnished by the officers of the company:—

"The North Bloomfield Gravel Company have constructed a ditch from Big Canyon Creek to Bloomfield, a distance of forty miles, with a carrying capacity of 3000 inches. This ditch has cost about $500,000, and is the best constructed and most substantial one in the State. They have also constructed a dam across Big Canyon Creek at Bowman's Ranch, sixty-five feet high and 215 feet in length, giving them a reservoir capable of retaining 400,000,000 cubic feet of water. In addition to this immense supply of water, the company own several important water rights in the line of their ditch, which afford a large amount of water during the rainy season. They also own the Rudycan reservoir, formerly owned by an English company, distant thirteen miles from the line of their present ditch. This is the largest reservoir in the State, and cost the English company over $100,000. From Bloomfield this company have constructed another ditch, seven miles long, to Columbia Hill, to supply water to the Union Gravel Mining Company, a majority of the stock of which is owned by the North Bloomfield G. M. Company. The mining claims of this company are at present fitted with pipes, etc., costing some $40,000. Their network of mining flumes is about one and a quarter miles in aggregate length, varying in width from forty to seventy-two inches. When these claims are running their full capacity, they will be using three Monitors, each capable of carrying 1200 inches of water; also what is known as a goose-neck, carrying some 600 inches of water. These pipes are used under a head of 300 feet, and it is estimated that the capacity of the work is an ability to mine 100,000 tons of gravel each twenty-four hours. When the works are in full operation, they will use about 80,000,000 gallons of water per day. The company is now running 1500 inches per day. The various flumes are so arranged that they can clean up, without stopping the work of mining. The main flumes are paved with stone, the branches with wooden blocks. The grade of the flumes is as a general thing six inches to each box of twelve feet, although some of them are upon a grade of five inches. The company have steadily prosecuted their work for the past three or four years, and when their subterranean works, now to be constructed, are completed, no one can doubt that great results will be obtained in the way of dividends. This company's new ditch was finished, and washing commenced September 15, 1870."

A prospecting shaft has been sunk to demonstrate the depth of the gravel and the pitch of the bed rock, preparatory to a survey for a gigantic bed rock tunnel. The shaft struck bed rock at a depth of 208 feet (Nov. 1870), and shows a fair quality of blue gravel, 138 feet in thickness, and very rich at the bottom.

Moore's Flat and Vicinity.—Six miles further up the ridge are the thriving towns of Moore's Flat and Eureka South, with many smaller camps, in which mining is actively carried on all the year round on account of the abundance of water, which rarely fails in these high regions. One company, at Moore's Flat, report $65,000 as the product of the season. The mining above this point is principally carried on in drifts under the lava crust, and the lead is lost in the heart of the Sierras. Between North Bloomfield (formerly known as Humbug) and Moore's Flat, on the north bank of the South Yuba, is the mining camp of Relief Hill, where six companies are engaged in hydraulic mining. From this point can be seen the extensive auriferous deposit between the South Yuba and Bear River, on which are situated the towns of Alpha, Omega and Washington. The whole northern slope of this "divide" has been worked for years, and is not yet exhausted. The general topography of these divides, and the situation of the detrital matter, would seem to indicate a general north and south sweep, which has been broken and eroded by the modern streams.

THE GRAVEL MINES OF NEVADA CITY AND GRASS VALLEY.

These localities are better known abroad for the productiveness of their quartz mines rather than for any notoriety acquired from their placers, which, however, were of unparalleled richness. At an early day attention was attracted to the richness of the gravel deposit lying under the ridge to the north of Nevada City. This ridge had been broken away in two places to a depth of one or two hundred feet, leaving a sugar-loaf-shaped mound between, and at this point drifts, then called "cayote holes," were run to develop the channel. Many of these claims have been abandoned, and at present the only extensive operations are carried on by MARCELLUS and MALTMAN under and on the Sugar-loaf referred to.

This deposit of gravel was discovered in the spring of 1852, directly north of what was called in early days the old "Cayote Hill," the bed-rock in the channel being some 25 feet lower than that of "Cayote Hill." Its general course is due north, running through the main ridge, and terminating at Selby Flat, a distance of about 3160 feet. Different companies located ground, claiming from 100 to 500 or 700 feet on the channel, and, with few exceptions, were largely rewarded for their exertions, some working with windlasses, whims, and steam-engines, sinking shafts or inclines, running tunnels from the shafts, and drifting the richest of the bottom gravel, using timbers usually four and a half feet in length, and leaving in and near the channel a strata of gravel overhead from 25 to 30 feet in depth, to the lower strata of pipe-clay which overlies the gravel deposit, though gravel and sand in alternate layers are found almost reaching the surface. The channel itself—or the lead, as it is called here—varies from 80 to 150 feet in width, but good pay is found the entire width of the deposit, averaging about 1000 feet wide from east to west side.

The present claims of MARCELLUS and MALTMAN are very extensive, they having bought out nearly all their neighbors. In 1855 they commenced a tunnel for the purpose of hydraulic washing, which was completed in 1859, at a cost of $30,000. The grade of this tunnel being used up, they decided to run another a distance of 2400 feet, which is 40 feet lower than the former, and will enable them to work all their ground. This new tunnel is now two-thirds completed, and, when finished, the total cost will not be far from $35,000.

The improved style of working this mine has demonstrated, during the past two seasons, that it can be worked for fifty per cent. of the gross yield; whereas, in former seasons, when worked by hydraulic washing on a small scale, the profits were not more than ten per cent. of the gross yield.

We are indebted to W. M. MALTMAN, Esq., of Nevada City, for the following statement of the yield of the gravel companies on this ridge. It is taken from the books of the companies:—

Eversall and Co. (discovered)	$120,000
Johnson and Co.	30,000
Henry, Craddock and Co.	75,000
Mountain Summit Company	125,000
Pacific "	120,000
Live Oak "	500,000
Young America Company	100,000
Bourbon "	50,000
United States "	80,000
Nebraska "	550,000
Nevada "	100,000
Keystone "	90,000

The above claims were all drifted.

The amounts of gold by hydraulic washing on this gravel deposit are:—

French Co.	40,000
White and Co.	30,000
Stewart and Co.	45,000
O. M. Tomlinson	125,000
Marcellus and Maltman	257,000
As nearly as ever can be ascertained—Total	$2,429,000

Three miles northwest of Nevada City the Cement Hill Tunnel and Fluming Company, a San Francisco incorporation, are fitting up for active operations next season. The grounds of this company have been noted for their immense yield. In 1853-54 the sum of $240,000 was taken from an area of ground embracing less than two acres of surface.

Within a few miles of Nevada City there are large tracts of gravel which will pay by systematic and economical management, and the next two years will witness the revival of many enterprises which could not be carried on under the old system of working these deposits.

Grass Valley, situated in a basin surrounded by hills two or three hundred feet in height, in which are found the quartz ledges which have given this locality a world-wide fame, was noted in early times for its rich placers. These diggings were the results of two causes—the decomposition of the surface quartz and the dispersion of an ancient channel which debouched on the basin near the northern limits of the present town. This channel had a general course from northeast to southwest, and was probably a tributary to the ancient water-course system, as its dimensions are insignificant compared to those already described—its width from rim to rim rarely exceeding one hundred and fifty feet, though it is covered by overlying gravel which overlaps its rims for a considerable distance on each side. The slide or breakage on the slopes of Alta Hill attracted attention at a very early period, and a tunnel was run in the hill which resulted in the development of the rich ground of the Alta Company. These claims yielded large returns for a year, and were then abandoned.

W. A. S.

On Ammonium and the Solubility of Metals Without Chemical Action.

By CHAS. A. SEELY.

IN April and May last it came in my way to make a pretty careful study of the constitution of the so-called ammonium amalgam, and on May 9th, I reported to the Lyceum of Natural History of New York what I had done in the matter up to that time. Subsequently, I continued the study, and was led to the discovery of the solubility of the alkali metals in anhydrous ammonia, an account of which formed a paper read at the Troy meeting of the American Association for the Advancement of Science. Neither of these communications has been printed; the first was oral, and the latter was lost. The present paper is intended to be a concise and authoritative statement of the contents of the two papers, and as a substitute for them.

In the Lyceum communication I proved that the so-called ammonium amalgam is in fact no amalgam at all, but a metallic froth, of which the liquid part is mercury and the gaseous part a mixture of hydrogen and ammonia. This conception of the nature of the substance was at that time not altogether novel, but the considerations through which the conclusion was reached were believed to be new, and of such moment that, taken together, they have the effect of a demonstration. The considerations were these:

1st. In the formation of ammonium amalgam the mercury is increased in bulk tenfold or more, while in weight it is increased only one or two thousandths. This fact would be easily predicted by the frothy theory, while otherwise it is anomalous and utterly inexplicable.

2d. Ammonium amalgam has less of the mirror surface than mercury; it approaches in appearance the whiteness and lack of lustre of matte silver. This fact also finds a satisfactory explanation in the frothy theory.

3d. Ammonium amalgam is readily compressible; when confined in a fire syringe, it steadily contracts on forcing down the piston till the original bulk of the mercury is almost reached, and on relieving the pressure, the original volume and appearance are resumed. It is only a froth which behaves in this manner.

Either (1) or (3) will be conclusive to many minds; (3) is put forward as a fair *experimentum crucis*. The condensation by pressure is easy to execute, and an elegant experiment for the lecture-room. The condensation is somewhat greater than in the case of atmospheric air, for the reason that some of the ammonia gas goes into the liquid state.

Having concluded that the ammonium amalgam is a mercuric froth, a very important question presents itself: Why and how do metal and gases become mingled? A froth is a mechanical mixture, and in all ordinary cases the manner of mixing and the forces engaged are quite evident. In the formation of the mercuric froth, the mercury covered by a watery solution rises up spontaneously into the comparatively light water, and the still lighter gases descend into the mercury, and mingle with it until they become diffused through its whole mass. What are the forces which thus overpower the action of gravity? Moreover, a froth implies a certain viscosity or plasticity of the liquid, which seems not to be possessed by the mercury in its normal condition. Do hydrogen and ammonia in their nascent state have the power to modify the physical properties of mercury? The production of mercuric froth as a fact of physics simply may seem anomalous and paradoxical. Is it necessary after all to admit the ex-

istence of an ammonium amalgam, not of course as a constituent of the mercuric froth, but as a condition precedent of the formation of the latter—in other words, of another ammonium amalgam to satisfy a new theory?

I was making satisfactory progress in the investigation of the theory of mercuric froth, when, early in May, my attention was diverted to the researches of WEYL on ammonium and compound ammoniums, as reported in *Watt's Dictionary* (article, Sodium), and in the last edition of *Fownes' Chemistry*; subsequently, I compared WEYL's original memoirs in *Poggendorff's Annalen* of 1864. WEYL's statements and conclusions were quite at variance with my own views; his alleged facts were inconsistent with my own experience. WEYL, it appeared, had actually isolated ammonium; if he represented the facts correctly, all my work needed revision. I therefore at once devoted my whole care to a verification of his results. I repeated his experiments, some of them many times, and with such precautions, modifications and additions as the case seemed to require. The result of all is, that I find that WEYL has had only an imperfect apprehension of the fundamental facts, and that thus building on a weak foundation the superstructure of reasoning and conclusion cannot stand. For the purpose of presenting in a clear light what I suppose to be of more interest to the chemical world, I dismiss, for the time, the consideration of WEYL's views, and I proceed to give what in my judgment are the proved physical and chemical facts.

This discussion involves the relation of ammonia to the alkali metals, and the results which grow out of that relation. Now, the key to the whole subject is the fact that liquid anhydrous ammonia is a solvent, without definite chemical action, of the alkali metals. I mean that these metals dissolve in the ammonia as salt dissolves in water—the solid disappears in the liquid, and on evaporating the liquid, the solid reappears in its original form and character. There is no definite atomic action in any such cases; the components of the solution are not changed in their chemical relations to other substances.

I began my experiments by bringing together ammonia and the metals in sealed inverted U-shaped glass tubes. Chloride of silver saturated with ammonia was placed in one leg of the tube, and the metal under test in the other; the chloride of silver leg being immersed in boiling water, and the other in ice-cold water, the ammonia was liberated and passing over was gradually condensed on the metal. Such an arrangement, although sufficient to demonstrate the fact of the solution of the metal, proved inconvenient in several respects; the tube is liable to burst, the experiment can be made only on a pretty small scale, the chloride of silver does not absorb a desirable amount of ammonia, and by reason of its fusing or agglomerating, the rapidity of its absorption varies greatly. I therefore constructed an ammonia generator or retort of iron, to the horizontal neck of which turned downward at its end, I attached by means of an iron screw coupling the stout glass tube containing the metal or other substance to be subjected to the ammonia. In the place of the chloride of silver I substituted anhydrous chloride of calcium saturated at 32° Fahr. with anhydrous ammonia. With this arrangement the experiments were continued with comparative ease and expedition.

When sodium is subjected in this apparatus to the condensing ammonia, before any ammonia is visibly condensed to the liquid state, it gradually loses its lustre, becomes of a dark hue, and increases in bulk. The solid then appears to become pasty, and at last we have only a homogeneous mobile liquid. During the liquefaction, and for a little time after, the mass is of a lustrous, copper-red hue; the condensation of the ammonia and its mingling with the liquid steadily goes on, the liquid is progressively diluted, and passing through a variety of tints by reflected light at last it becomes plainly transparent and of a lively blue as well by reflected as by transmitted light; the liquid now closely resembles a solution of aniline blue or other pure blue dye-stuff. On reversing the process by cooling the ammonia generator, the ammonia gradually evaporates out of the liquid, and the changes observed during the condensation reappear in the reverse order, till at last the sodium is restored to its original bright metallic state. If the evaporation be conducted slowly and quietly the sodium is left in crystals of the forms seen in snow. The formation of the transparent blue liquid and the restoration of the sodium are steadily progressive, and the repeated and closest scrutiny of the process has failed to reveal the slightest break or irregularity in its continuity. The inevitable conclusion from such facts is that the blue liquid is a simple solution of sodium in ammonia, not at all complicated or modified by any definite chemical action.

If crystallized sodium amalgam be made to replace the sodium in the experiment it remains unchanged, although it is probable enough that at a higher temperature or with a larger excess of sodium, some of the sodium would be removed. This interesting fact is consistent with the simple solubility of sodium in ammonia, and indeed is some confirmation of it. The force, whatever it be, which keeps together sodium and mercury is certainly weaker than that exhibited between sodium and ammonia. If sodium amalgam is not a definite chemical compound, then surely the blue liquid cannot be. I have not yet made the experiment to determine whether mercury will remove sodium from its ammoniacal solution, but it seems extremely probable that it would so act.

The brilliant and varied colors exhibited in the experiment may seem anomalous to some, when, in fact, a closer scrutiny of the case will show that they might have been predicted. Sodium appears white to the eye, but with the white light reflected from its surface to the eye, there are always mingled red rays. If most of the incident white light were normally decomposed, sodium would appear as a brilliant red metal. Ammonia favors such a decomposition probably by reducing the density and opacity of the surface, and thus the concentrated solution of sodium is lustrous copper-red by reflected light. What should be the color by transmitted light? Not red, for the red rays do not penetrate the substance; the color must be looked for in that which is complementary to red; it must be blue or yellow or combinations of these. A continuance of the argument will bring the conclusion that the color by transmitted light will be blue. Intense blue tinctorial substance, like aniline blue, indigo and Prussian blue, all illustrate the phenomena of color of the sodium solution; they are metallic red when concentrated, and if the solvent be applied in vapor as in the sodium dissolving experiment, there will be the same modification of color exhibited. Sodium has a remarkable tinctorial power which seems not to be surpassed by that of any of the aniline colors.*

If a salt of a metal electrically negative to sodium be subjected with the sodium to the ammonia, in the apparatus, the sodium will replace the negative metal, and the latter will be reduced to the simple state. This reduction seems always to be accompanied with the evolution of heat, but does not commence till a visible quantity of the sodium solution is formed. It is possible that there may be exceptions to these generalizations. I need only say that they seem extremely reasonable, and are confirmed by a good many experiments. The reaction furnishes a very simple and elegant process for the reduction of rare metals. I anticipate that the process will prove of great value.

I have heretofore spoken of the solution of sodium only, and for the reason that it is a typical case, and because demonstrations can be more satisfactorily made with it. Potassium behaves towards ammonia in almost precisely the same way. It is readily dissolved, the strong solution being copper-red and the diluted solution blue. Lithium gives also a blue solution, but is not nearly so soluble. The only other alkali metal I have tried is rubidium, and although the experiment was prematurely ended, it had progressed far enough to make it almost certain that rubidium is soluble like potassium, and I intend, as soon as I can procure material, to repeat the rubidium experiment.

Besides the metals named, I have subjected many others to the ammonia, and have found none outside of the alkali metals which are in the least affected. I have directly tried aluminium, magnesium, thallium, indium, mercury and copper.

It was my intention, in conclusion, to consider the experiments and conclusions of WEYL, and thus fully to accord to him the great credit to which he is entitled. But I content myself by again referring the reader to WEYL's original memoirs in *Poggendorff's Annalen* for 1864. I have exceeded the reasonable limits of this article and I regretfully bring it to a close.—*Journal of the Franklin Institute.*

* For a further elucidation of the matter of this paragraph I would refer the reader to my paper on the "Colors of Metals," printed in the proceedings of the Lyceum of Natural History, of New York, of October, 1870.

Wooden Railways.

"IN regard to the durability of a wooden track, the President of the Clifton road says that the company expect to move from 50,000 to 100,000 tuns of freight yearly, and that the rails will last five or six years. He also says that light trains have been run on that road at twenty miles an hour. It does not appear that any of the new wooden rails are mounted with iron straps after the fashion of the old wooden roads, and it is doubtful whether that was any advantage. The writer had some experience years ago on a 'strap-road,' and it then seemed that the strap was a damage rather than a benefit. Those who are about to build wooden roads will no doubt be interested to know in what way a bar of iron two inches by one-half inch, spiked to the top of a wooden rail, would be a damage. Firstly, there is the cost of the iron and spikes, and the expense of laying it, whatever that may be. After this is done, the first injury noticeable is the injury to the rails caused by the spikes. The rails are frequently split and the spikes soon work loose, leaving a space for water to enter, which causes the rails to decay rapidly; and as the iron will not fit the wooden rail so snugly as to exclude water, the wood under the iron is constantly wet or moist, which causes the iron to force its way into the wood, and in a very short time the bar will have settled its thickness into the rail, so that the portion of the tread of the wheel outside of the iron would run on the wood. We have noticed that after a new rail had been in the track a few weeks, there would be a layer of pulp one-eighth of an inch thick (or perhaps one-sixteenth would be nearer the truth) between the strap and the rail, while that portion of the wood outside the strap remained sound. Of course this pulp was formed from the fibres of the wood which had become separated by the action of the moisture, assisted by the vibration of the strap while trains were passing, and was nothing more nor less than decay. We also noticed that the portions of the rails outside the straps that were acted upon by the tread of the wheels grew hard instead of 'pulping' like the portion under the iron. The rolling of the wheels on the wood had the effect to expel the moisture (on the principle of a clothes wringer) and to compress the fibres of the wood, and in a great measure prevent decay. It is doubtful about the straps strengthening the rail to such an extent as was generally supposed. A bar of iron one-half inch or five-eighths inch thick laid flatwise would of itself sustain only a light load, but by reason of its continuous support by the wooden rail would add considerably to the strength of the wood. But it is safe to say that the strap will not strengthen the rail sufficiently to warrant the expense of using it. Another serious objection to the strap is contraction and expansion, which frequently renders it difficult to keep the track in a safe condition. We have seen these strap rails buckled and twisted by the force of expansion until they were torn from the track, in fact resembling a quantity of old harness strewn along the track. Another trouble arising from the use of iron on a wooden rail is what we used to call 'snake-heads.' The action of heavy loads rolling over these flat bars is similar to that of the machines used for bending wagon tires, giving the ends of the bars a tendency to rise, drawing the spike with it. It is exceedingly difficult, we may say impossible, to prevent this, and when the bar has once commenced bending it seems to bend more rapidly, or the more it is bent the easier it bends, and pretty soon the bar is curled up in the form of a section of wagon tire. These are the 'snake-heads,' and so long as they did not reach above the centre of the wheels they were not regarded as dangerous; but as soon as a wheel struck one that had curved a little too much, there was mischief. Those who have never witnessed a wheel running under a 'snake-head' can scarcely imagine its effect. A twenty-foot bar of iron wriggling its way through a well-filled passenger coach has, on more than one occasion, resulted in the mangling of as many human forms as some of our first-class 'smash-ups.' To all these charges against the strap-rail may be added the expense of track repairs, which will obviously be much greater with than without the iron. From the nature of the combination of the wood-and-strap rail, it is necessary that it be kept in good repair. Of course this is important on any railroad, but a slight derangement of the strap road would be dangerous, and such a road would need constant watching, and would require a larger number of men to keep it safe than a well-built wooden track without the straps.

"And, finally, if cheapness is the main reason for building a wooden railroad instead of an iron one, the least iron used within reason, the better. There are thousands of places in this country where wooden tracks could be built and operated with profit; and in most of such cases where the traffic would not pay for the building of iron roads at present, if wooden roads were now built the traffic would increase, so that by the time the rails need renewal, or extensive repairs became necessary, it would pay to lay a substantial iron track. It would, therefore, seem advisable to use the present standard gauge (4 feet 8½ inches). The road-bed would then become firmly settled and everything in good condition for the iron, to say nothing of the convenience and economy, in the meantime, of moving freight without transhipment. The rolling-stock on a wooden railroad may be so constructed as to run with safety on iron roads connecting, so that cars may be run into the timber regions or the mines, and loaded and sent to market without unloading; and if cars were so built they need not be thrown away when the change is made to an iron road, and that would be money saved."—*Railroad Gazette.*

MINING SUMMARY.

Nevada.

THE MINES AND FURNACES OF EUREKA DISTRICT.

The *Sentinel* of March 4 reports that the Roslin Furnace has been turning out an amount of bullion that has astonished even the owners. For some time the principal ore worked has been from the Bullwhacker. The ore in this mine can be literally quarried out, and, in addition to the contract to furnish 4,000 tons to the Silver West, and a large quantity to the Roslin Furnace, MURPHY & FOREMAN are making arrangements to build a furnace.

BUTTERCUP.—Furnaces have started and turned out large quantities of bullion of high grade. A new chamber has been struck in the Jackson mine, of very rich ore, and much larger than ever before. OGDEN, DUNNE & Co. have consolidated with MESSRS. ADAMS, MCCOY and others, under the name of Richmond Mining Company, with a capital of $250,000. They will begin to turn out bullion in two weeks. The Jones mine has thirty or forty tons ore on dump that will mill $200. The Hodgdon mine improves. So does the Adams & Farren. A twenty-stamp mill will be running July 1st on the Geddes & Bertrand mines. The Home Ticket never looked so well. The Stockton has a large amount of ore exposed. The X Y Z has become the property of the South Eureka Co. and is getting fine ore in large quantity. It has been incorporated at $2,500,000, and the superintendent informs us that by selling the ores the stockholders can realize two per cent. per month on the capital; while it is the intention to put up furnaces as soon as spring opens. A full number of mechanics are at work on the Richmond furnace, and it will soon be ready to fire up. When this is completed there will be an addition of seven to nine tons to the bullion yield to the district. The ore from the Richmond and other mines will be worked, and quantity and quality will both be an object with the company. "We need," says the *Sentinel*, "twenty as good furnaces as this to use up the ore as fast as the miners are producing it."

BEESE RIVER DISTRICT.

According to the *Revielle*, March 22d, the amount of bullion shipped by the Manhattan Co., of Austin, through WELLS, FARGO & Co., during the month of February, was eighty-eight bars of the value of $88,781 42; total amount shipped from this city during February, 118 bars of bullion, weighing 10,026 pounds, and of the aggregate value of $101,801 61. Thirty-four of the bars were the product of Canfield mills, at Belmont, ten from Montezuma, and the balance Manhattan mill.

ELKO.

A correspondent, writing to the Elko *Independent*, March 11, from Toano, under date of March 8th, gives us the following concerning a recent discovery of rich silver-bearing rock: "A gentleman, just returned from the Clifton district, brings news of a rich discovery recently made in that locality. A party of miners left Kelton about five weeks ago, and after travelling several days, and on reaching a point about sixty-five miles southeast of Toano, they discovered silver-bearing quartz of extreme richness, which in the opinion of some bids fair to eclipse any previous discovery in Eastern Nevada. Assays have been made from five ledges, which range all the way from $300 to $600 to the ton.

HUMBOLDT DISTRICT.

The *Silver State* of March 11 understands that it is the intention of the Nevada Land and Mining Company, owners of the Whitmore mine, to resume operations at an early day. Shipments of ore still continue from Mill City to the Auburn Mill at Reno. Mr. King has returns from a lot recently treated, which yielded $175 per ton, and CLARKE Brother, another lot, showing $130 50 per ton. The De Soto mine in Star City continues to yield excellent ore. The Sheba is also being worked with favorable results.

Arizona.

ALL ABOUT THE IMMENSELY RICH "STRIKE" OF GOLD AND SILVER MINES IN BRADSHAW MOUNTAINS.

A correspondent of the Arizona *Citizen*, writing from Prescott, Feb. 3d, thus speaks of the mines that have caused the last great excitement in Arizona: "After the dullest fall and winter ever known within the memory of the 'oldest inhabitant' of Prescott, a great sensation has stirred us up during the week ending to-day. It happened thus: A party of four experienced miners have been prospecting south of the Bradshaw mountains for some weeks past, and at last 'struck it', near the head of Humbug Creek, in the shape of a large vein of silver-bearing galena. They examined the vein carefully, chose their portion, made their locations, and then took their tools and dug a hole about three feet deep on the lode, and from the ore taken from the hole loaded their animals, and came to Prescott, bringing 400 or 500 pounds of the best silver ore ever seen in this locality. All the miners hereabout, who know anything of silver ores, were sure it was good at first sight, and all who understood the process were allowed to take their pick of samples for assay and working tests, and the results of half a dozen such trials of the average ore, were yields of from $1,600 to $1,950 of pure silver per ton. One of the richest samples, worked by smelting, gave $11,900 per ton in silver. These products, with the statements of the fortunate discoverers that the vein on the surface was from eight to twenty feet wide, and plain to be seen for two miles or more in length, roused the dormant blood of the oldest prospectors in town. Messrs. HAMMOND, MORLAND, and their companions came to town on Saturday, the 28th inst., and the ore tests were made that day and Sunday, and from Monday morning till Wednesday night a string of horses, mules, jacks and men lined the trail leading towards the Bradshaw. Laughable scenes were enacted, and great the demand for riding and pack-animals. Of those who knew the country and had located in the neighborhood on silver veins in 1865, many stood not upon the order of their going, but left on Monday—with some new-comers in their train; others, who have pooh-poohed at every little stir for the last four years, stole away quietly after Monday night had set in, and when such were found missing on Tuesday morning, others caught the fever and followed on, till on Wednesday it seemed that the town was nearly deserted. The exodus from Tucson for the Burro mines last spring was something in the same line, I presume. There is a good cause for this excitement in the fact that this lode is situated in the vicinity of the immense silver-bearing lodes on Silver Mountain, which were discovered and located in 1865, and are as large as the lodes in the Burro Mountains, though the average assays from them, made here and in San Francisco, were not rich enough to induce capitalists to venture into an Indian country, and the locators being poor men, little has been done towards developing the lodes—though in any other country, such prospects on the surface as from $12 to $263 per ton, in silver, from lodes varying from twenty to 150 feet in width, and cropping out ten to twenty feet above the earth for more than a mile, would have caused an outlay of thousands on thousands of dollars to open the veins, in the expectation, almost certain, to be rewarded by finding richer ore at lower depths. But here in Arizona, something of extraordinary richness must be found, and plenty of it, before the outside 'barbariana' will believe in our report of the land. So when this vein, which is named the Tiger, turned out ore worth over $1,000 per ton, it is no wonder that the old '65-ers who located the Mammoth, Marsh, Antietam, Huff, Snowball, and other lodes in Silver Mountain, which they have shepherded for five years, thinking their time is coming, concluded to rush out and protect their claims from jumpers during the excitement. So they went from among us. When they come back, if their reports are good or bad, you shall have a line or two on the point from H."

"PRESCOTT, Feb. 10, 1871.—Last week the Tiger lode excitement was the foundation of my epistle, and pursuant thereto I must continue in this. Several of those who left town between two days, early last week, have returned, and, contrary to all expectations, all tell the same story—thus: The original Tiger is a magnificent success, the lode or vein has been traced by skilful prospectors for nearly eight miles; for more than two miles every foot has been taken up; on half a dozen claims shafts have been started, and in every instance good ore has been found, and in at least two locations the owners and others believe their prospects are better than those on the discovery claims. Those who did not get satisfactory locations on the Tiger, struck out into the neighboring country and discovered and located on several other silver-bearing veins, which promise well, although not as large, long, or on the surface as rich as the Tiger—and named them the Tigress, Lion, Lamb, etc.

Our townsman, W. C. COLLIER, has declared his intention to move all his household goods to his claim on the Tiger, and camp there till he gets all the silver he wants. Mr. C. has for seven years spent all he could make in other ways in prospecting for quartz, and feels sure that he has got his fortune before him now. It is asserted by interested parties that ore amounting to several hundred pounds in weight, taken from different locations on the Tiger, carefully sacked and marked, will be sent to San Francisco to be worked for both silver and gold, in order that operations may be started understandingly; though persons accustomed to the smelting process say there can be no question of the expediency of erecting small furnaces, and commencing paying operations at once. As a portion of the vein runs through heavy pine timber, charcoal can be made on the spot, and if the size and richness of the vein continues down into the depths of the earth, there will be, in time, a flourishing town. Anticipating such results, some enterprising parties have already laid off and claimed a town site near the mine, hoping doubtless to realize from the sale of corner lots after awhile; and if the ore is carbonate of lead, as stated by parties professing to know, and the Tiger furnishes plenty of it, a state of things similar to that at Eureka, Nevada, may arise at the foot of Bradshaw mountain, smelting may become a permanent business, teams that freight our provisions in may go out laden with silver bullion, and the owners of feet and town lots be happy.

Notwithstanding the silver fever, the gold-bearing veins are not abandoned on the Bradshaw mountain, or elsewhere. Reports from the Del Pasco, which has been the leading trump in our mining circles during the past few months, from the mines on Lynx Creek, and the Eugenia on Big Bug (from the latter, the Big Bug Mill has been crushing ore constantly for the past year,) are more encouraging now than ever before. So our quartz mining population is jolly, while the placer miners and farmers are praying for snow and rain, either or both." H.

New Mexico.

THE RALSTON AND SILVER CITY MINES.

A letter written by Mr. GEORGE W. ARNOLD, of Fort Bayard, New Mexico, and published in the Rocky Mountain *News*, concludes as follows: "I have just received your letter, written at Denver, inquiring about the New Mexico silver mines. Ralston, at present, holds a second place in the minds of the people. It is in the hands of the California Bank company, and will probably remain so too long to be of any benefit to any one. But Silver City is not so. It is still in first hands, and I believe is as rich as any previous discovery in the west. I am well acquainted there, and intend to go into business at that point soon. I have seen a statement of about 100 assays, not one of which went below $90 per ton, and the most of them between $800 and $3,200 per ton. The facts concerning these mines seem almost incredible, still they are facts, and I firmly believe that Silver City will, this summer, be the centre of the richest and most extensive mining business yet known. RYNERSON is putting up smelting works. Mr. CARSON and a practical refiner (I have forgotten his name) with eastern capital are soon to commence the erection of a large mill. One miner here has now at the mouth of his shaft 100 tons of rock that experts believe to be worth $1000 per ton. I have never since the palmy days of California seen such an opening for business, although it is true that times are hard and money scarce just now, because none is coming out of the mines yet, except what is taken out by a Mexican, who has a little smelting outfit with which he takes out eight or ten pounds a week; but it is understood that Mr. MAXWELL will have a large mill here as soon as grass comes, and that RYNERSON'S and other smelting works will soon be in operation, which will at once change the aspect of affairs. The Cieniga or Silver City is situated twelve miles directly west from this post, and the same distance almost directly south of Pinos Altos; there is enough water to furnish a large business, and good wells abound over the town site. It is only six miles to the saw mill where there are 50,000 feet of lumber on hand and an abundance of good timber. The distance from Santa Fe to the Miembres river is 386 miles, and the fare is $95. From Miembres river to the Cieniga is 27 miles; the fare $5. Messrs. SHEDD & BLAKE are re-opening the old Stevenson mine in the Organ mountains, near Las Cruces, with very flattering prospects of striking it rich."

The San Diego *Union*, of February 23d, also has a Ralston letter from which the following is an extract: "News has been received that an English company has purchased property to the amount of $1,000,000, and that very soon work will commence on a large scale on nearly all the main ledges. Already shafts are being sunk on two of the New Mexican Mining Co.'s claims—the Jackson and Potosi—and at a depth of twenty feet the quartz is found much improved in appearance. Many new ledges have been discovered this winter, some of which are ten feet wide."

Utah.

THE SILVER MINES.

The Colorado *Register* for March 1st says: The reported sale of the Emma mine, in Utah, has fallen through, owing to the fact that JAMES E. LYON has set up an adverse title. He claims that he owned the mine and struck pay there years ago; and that the parties who recently negotiated the reported sale were the ones whom he had employed to work on it.

An Ogden telegram of March 2d says there is excitement over the discovery of rich surface gold diggings one mile from the Ogden depot. The claims are being rapidly taken up.

Silver ore is beginning to arrive in New York in large quantities from Salt Lake City. Forty-seven car-loads have just reached here from the the Emma Mine, and 1,460 tons more are on the way, together with 12,000 pounds of base silver bullion. The ore comes in one hundred pound sacks.

A CHICAGO WRITER ON UTAH.

The following is an extract from a letter in the Chicago *Times*, dated Salt Lake City, Feb. 22: The silver mines of Utah are different in character from any which have ever been discovered elsewhere. Many of them are very rich, and many are very poor. None of them offer any inducements to adventurers who bring no capital but muscle. All of them require capital for their successful development. Labor is plenty and cheap, as skilled Mormon miners from Wales, England, Sweden, Norway, and other sections of the globe are ready and willing to work, and board themselves, at $3 per day. And the leaders of the Church of Later-day Saints advise and instruct their followers to accept situations in the mines at that price. Of course, then, it follows that foreign muscle cannot be brought here from the East and successfully placed in competition with that which is at home here, and abundantly supplied with subsistence of their own production. There are 100,000 Mormons in Utah, and they can supply the labor for all the mines that are now in process of development or that will be worked for many years to come.

The Emma mine is the only one which is now paying largely. The ore from this mine nets about $150 to the ton after transportation to Swansea, in Wales, for its reduction and refinement. There are, perhaps, a few others which are paying tolerably well. The mountains, and gorges, and kanyons are now full of snow, and miners cannot prospect at all, nor will they be able to prospect before the 1st of June. That there are vast stores of precious metals hid in the rocky vaults of these mountains I have every reason to firmly believe, but my faith that it will require enormous capital to unlock these vaults and pour their treasures into the channels of commerce is equally strong and well-grounded.

Men who can bring here $5000, $10,000, or $20,000 each, and by association erect mills for quartz crushing and smelting works, can make large gains, enormous profits, and the investment will be a safe one. But poor men, men who have no capital but good health and laborious muscles, can do far better to remain in the States than to seek fortunes in the fastnesses of these frowning mountains.

California.

The Monitor *Miner* has reliable authority for stating that the Schenectady Company, operating the Tarshish mine, in Alpine county, will at once commence the erection of reduction works. "Mr. GEISSENHAINER, one of the heaviest stockholders, who was here and so well pleased with the mine last fall, will soon again be here, to assist in pushing forward the work with his well-known zeal and enterprise. The mine is turning out more and better ore than at any previous time; some four-thousand dollar ore having been found recently, and a vast body of pay-rock in sight." The vein in the Chicago tunnel is said to be looking better than ever. The Globe presents more flattering appearances. A correspondent of the Nevada *Transcript*, writing from Rough and Ready, March 4, says that JOHN LANDIS and JAMES BLACK, owners of the Goshen Hill claims, have just completed a sluice tunnel 1,000 feet long, after thirteen months steady work, and have an excellent three-foot flume through the tunnel, 1,100 feet long. They have 5,000 feet of eleven-inch hydraulic pipe with a fall of 200 feet, leading their water to a CRAIG'S patent-monitor nozzle. They will commence washing on Monday. The expense of fitting up these claims has been $15,000.

The San Diego *Union*, Feb. 23, continues to receive good news from the Julian and Banner districts. The mines in the San Felipe Cañon are turning out handsomely. MCMECHAN'S mill is running steadily. A large shipment of bullion left that mill yesterday for PAULY & Sons of this city. This firm forwarded $1,600 worth of bullion from the Helvetia mine to San Francisco by the last steamer. A telegram, dated March 2d, says: "At Julian City the late storm raged for three days. The roads are almost entirely destroyed, and in consequence of the impossibility of getting quartz to the mill, mining operations will be suspended until the roads can be repaired.

According to a correspondent of the *Journal* of March 4, parties on Clear Creek report the good prospects as still holding out, and plenty of good ground for others. "It is hard getting in there now on account of the snow. A German started three weeks since to go over there, but getting lost was obliged to lie out in the rain: the next day he stumbled upon a quartz ledge on the head of Hay Gulch, and came back to town for provisions, intending to return and prospect it. The specimens that he showed contained gold near visible to the naked eye. PETER LUND came in the other day with $80 in coarse gold that he had taken out with a pan alone from some diggings on one of the tributaries of the East Fork."

Lake Superior Silver Mines.

The Ontonagon *Miner* has news from these mines up to January 6th. It says that at Silver Island "the shaft is down 20 feet; the mine is looking as well if not better as they go down, and they are taking out some very rich rocks." A citizen of Ontonagon has received a letter from Capt. JOHN BECK, the superintendent of the mine discovered last fall on Thunder Bay, from which the *Miner* makes the following extracts:

"The location is situated on Thunder Bay and east of the Thunder Bay mine; they are working several men and have sunk one shaft 12 feet. They were taking out chunks of solid silver from a half to a pound in weight, and the mine is getting richer every day in solid masses of silver. They have erected some seven buildings, which looks as if they mean business. The mine has been visited by a Mr. GRIFFITHS, who says he never saw richer mines on the Pacific coast. They are in want of eight more miners."

One of our citizens has received a letter, dated Lansing, February 19, from an old Lake Superior mining man, now a member of the Michigan Legislature, from which we have been permitted to make the following extracts: "It is reported here that the amount of silver being raised per month at Silver Island is $100,000. This information comes through Detroit sources. E. B. WARD, of Detroit, is building furnaces to treat all silver ore of Silver Island, and from other sources from the North Shore, and he will have them ready to run in the spring. So you see the ball is rolling."

These are the mines we referred to in the *Times* several weeks since. It is stated that the Silver Island mine has lately been purchased from a Canada company by Detroit capitalists. The first eighty tons of ore from these mines yielded $1,000 per ton, and an assay of an average specimen, made by Dr. S. S. WALBANK of this place, yielded about $5,203 60 to the ton. There will, no doubt, be a great emigration of people to those mines in the spring, and we would not be surprised if numerous other veins, equally as rich as those above referred to, would be discovered on a thorough exploration of the country.

LATER.—The Duluth *Morning Call* of to-day says: "We learn from a private letter from Silver Island that the last five tons of ore, taken out on the 7th inst., yielded over $10,000 to the ton."

Arizona.

RICH DISCOVERIES REPORTED.

The Prescott *Miner*, February 4, has the following: "Recent discoveries of rich and extensive silver mines in the Bradshaw District have greatly excited our community, and the natural result is a great rush of people to that locality. DUD MORELAND and others returned from here last week, with five hundred pounds of the ore, which, after repeated, careful assays, was pronounced equal to first-class Nevada ores. As high as fifteen hundred ounces of silver, per ton of rock, were obtained, and the lowest assay exceeded eight hundred ounces. The principal mine—the "Tiger"—is a well-defined lode, cropping out continuously, for a distance of nearly three miles, and in places where the ledge can be fairly seen, showing a width of six feet. Work is to be commenced at once on this mine, and parties said to be competent to judge, confidently expect it will equal the celebrated Comstock. Work is progressing on a score of other mines in this district, and the miners are sanguine of success. It is expected that a saw-mill will soon be in operation in the heart of this mining section. In the Hassayampa district, the placer mines are yielding handsomely. Some work is being done on the Davis lode. From Lynx creek we learn that parties are working on an extension of the Vernon. It is rumored that several extensive purchases of mines, in various portions of the Territory, have been recently made, chiefly by English capitalists. It is to be hoped that the capital and labor employed in these enterprises will be judiciously and properly expended, and not squandered and misapplied, as has too often been the case in the management of the working of our mines; to which, as the principal cause, we attribute the failures heretofore made."

Colorado.

NEW AMALGAMATOR.

The Colorado *Herald* thus describes an amalgamator, designed for taking the flow from stamp mills, and by forcing it through quicksilver ensure the amalgamation of all free particles of fine gold. The bed of the machine has two cylinders, somewhat like Hungarian bowls. In these revolve very slowly two fluted wooden cylinders. The arms made by these flutings force the pulp through the charge of quicksilver, which is placed in the bowls. No quicksilver is used in the batteries. It is claimed that in this way all of the pulp must pass through the quicksilver and that perfect amalgamation thereby ensues. We hope some one will give it a trial. It is called the Eureka Amalgamator.

SALE OF COAL LANDS.

According to the Rocky Mountain *News* a one-half interest in 3500 acres of coal land in Fremont county has been sold to a company of eastern capitalists. The price paid for that interest is $80,000, and goes to a number of individuals, prominent among whom, besides Mr. CASSIDAY, is C. P. ELDER, of Denver. The purchasing company have also leased the other half of this coal property for fifteen years, and have made a working arrangement with the Union Coal Company, of Hannibal, Missouri, which latter company have contracted with the Kansas Pacific railway company to supply the railroad for fifteen years.

MARKET REVIEW.

The Coal Trade.

NEW YORK, March 24, 1871.

Information from our various correspondents throughout the coal regions denotes no change in the situation. The suspension and embargo on transportation yet remain in force, and there is but little coal coming to tide-water compared with the same time last year. The general receipts at present are some 30,000 tons per week, and the aggregate loss up to present date amounts to some 1,100,000 tons. In the meantime the stock on hand, and all that can be collected, is being disposed of, and a genuine hard-coal famine begins to be realized.

The Legislative Committee of Investigation, which has been in session at Harrisburg, Pa., during the past two weeks, making inquiries into the real cause of the present difficulties, and as to whether legislative action can remedy matters, pursue their duties slowly, and have thus far accomplished but little. The operators and railroad companies have had their say, and now it remains to be seen whether the laboring man shall have an equal chance to protect his rights and interests.

We have many inquiries as to the prospect of an early resumption of operations. The miners still show a bold front, and a determination never before equalled; some four months have elapsed since the suspension commenced, notwithstanding which we see no signs of great poverty.

We hear of no acts of violence attributable to any member of the organization, but on the contrary a quick response from the treasury in the matter of rewards for the apprehension of parties outside of the organization who have committed unlawful acts. We believe that a majority of the miners are able to "fight this fight" as long as their opponents, even should it last a year from this time.

In our last issue we urged the operators and railroad companies to offer to arbitrate the matter, and meet the miners on fair ground. We are satisfied that the latter are a reasonable, sensible set of men, and demand simply justice—and further, that the leading men of their organization mean they shall have it.

In the absence of anthracite coals from Maryland, bituminous coals are largely coming into use, and, notwithstanding that the demand is great, the trade refuses to advance the price. Other kinds of fuel are also benefitted by the absence of anthracite coal. The manufacture of peat has received a new stimulus, and many parties are making preparations to introduce it extensively to the notice of the public. A kind of soft coal, called lignite, found in New Jersey, (upon which there is no duty,) is also attracting some attention; so, altogether, it does not appear as though we would suffer very much in the absence of anthracite coal. When anthracite coal is furnished at from $6 to $7 50 per ton, the above-mentioned substitutes cannot find a market, in consequence of the competition, the high rate of labor in their preparation, and the difficulty in manufacturing them. Let these drawbacks, however, be overcome, and let them get a fair foothold in the community. Let our manufacturers once become assured of their true value (for many kinds of this fuel are superior steam generators) and they will, no doubt, come into general use, and be found to answer their purpose admirably. The community must have a certain amount of fuel, be it of what kind it may, and our friends in the retail trade would as soon make a profit on one as another. In fact, this branch of the coal trade would be assured, and a more steady and less speculative business would be the consequence, and prove more remunerative.

The retail dealers can do their share towards preventing the recurrence of the present difficulties in the coal regions, and we hope they will take speedy action to that purpose. Let them supply themselves with a stock of our best Cumberland coal, etc., and they will find that a steady and growing demand will be the result. Customers, and especially our manufacturers, will become accustomed to them, like them, and eventually will have no other. Those first in this new field of the retail coal trade will make the most money. This is a progressive age, and those who desire to succeed in business must keep up with it.

There has been a little change in prices since our last. Miners and shippers of Cumberland Coal, in consequence of an over-anxiety to meet the extra demand, have been somewhat injudicious in their shipments, and overstocked the market. A few stray lots on demurrage have been sold as low as $7 25—the price asked gene rally, however, is $7 50. Anthracite coals have advanced slightly. We quote Lump Steamer and Broken: $9 to $9 50; Stove, $10.

Freights are in light demand, and rule low.

Bituminous Coal Trade, 1870 and 1871.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending March. 18, 1871, compared with week ending March 19, 1870.

COMPANIES.	1870. Week.	1870. Year.	1871. Week.	1871. Year.
B. & O. R. R.	.....	88,968	31,071	201,057
C. & O. Canal	.....	.....	49,971	226,389
H. & B. T. R. R.	4,994	45,992	8,183	57,205
Harrisburg & D.	7,886	103,028	16,234	106,897
L. V. R. R.	.....	3,310	7,250	12,734
P. & N.Y.C. & R. Co.	1,858	44,559	4,391	60,541
Total				

Anthracite Coal Trade for 1870 and 1871.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending March 18, 1871, compared with week ending March 19, 1870.

COMPANIES.	1870. WEEK.	1870. TOTAL.	1871. WEEK.	1871. TOTAL.
*Phila & Reading R.R.	34,141	583,011	5,497	598,201
†Schuylkill Canal	....	34,273	126	36,333
Lehigh Valley R. R.	32,110	663,501	6,887	373,716
Lehigh & Sus. R. R.	10,539	158,788	1,559	67,128
†Lehigh Canal	....	....	....	....
Scranton North	6,765	128,185	....	....
" South	25,016	332,896	....	....
Penn. Coal Co., rail	11,476	184,021	233	3,241
" " canal	....	....	....	....
Del. & Hud. Canal Co.	....	....	....	....
" " East	7,274	101,049	....	48,332
" " West	956	20,183	....	12,721
South	5,165	37,762	....	....
Shamokin	3,757	55,507	7,025	88,522
Trevorton	114	3,733	..	....
Lykens Valley Coal Co.	....	....	....	10,046
Wyoming South	....	....	....	....
Wyoming North	....	....	....	....
P. N. Y. C. & R. R. Co.	....	40,942	60	34,331
Williamstown Col'y	4,713	44,521	....	15,342
Big Lick Col.	....	....	2,029	....
Total	143,026	2,388,462	23,408	1,287,933
1870	23,408	1,287,933		
Decrease week and yea.	118,618	1,100,529		

* Less coal transported for Company's use and Bituminous coal.
†Closed for the season.

Philadelphia and Reading R. R.

Amount of coal transported on the Philadelphia and Reading Railroad during the week ending Saturday, March 18, 1871:

From St. Clair	
" Port Carbon	301 02
" Pottsville	22 03
" Schuylkill Haven	687 04
" Auburn	1,586 03
" Port Clinton	2,939 07
" Allentown and Alburtis	
" Harrisburgh and Dauphin	16,234 10
Total paying freight	21,722 09
Coal for Company's use	3,165 17
Total for week	24,888 06
Previously this year	621,666 09
Total	646,554 15
To same time last year	725,198 10

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, March 18, 1871.

BY RAILROAD.—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB VAL. BRANCH.

	Tons. Cwt.
From St. Clair	
" Port Carbon	301 02
" Pottsville	22 03
" Schuylkill Haven	687 04
" Pine Grove	700 12
" Tamaqua	2,889 07
" Harrisburg	171 18
" Dauphin	5,707 17
Total	10,480 03

FOR SHIPMENT BY CANAL.

Passing Frackville Scales	
" Mill Creek "	
" Schuylkill Valley Scales	
" Mt. Carbon "	
" Cressona "	374 00
" Pine Grove "	
" Tamaqua "	
Total	374 00

SHIPPED WESTWARD VIA NORTHERN CENTRAL RAILROAD.

Passing Locust Gap	2,581 02
" Shamokin	3,402 08
" Herndon	
Total	5,983 10

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	710 15
" Lebanon & Pine Grove Branch	256 14
Total	967 09

CONSUMED ON LATERALS.

From Frackville Scales	
" Mill Creek "	190 03
" Schuylkill Valley Scales	843 10
" Mt. Carbon "	145 10
" Cressona "	55 00
" Pine Grove "	89 15
" Tamaqua "	152 07
" Shamokin "	
" Trevorton "	
Total	1,476 05

LEHIGH AND WYOMING COAL.

Received via Allentown, E. Penn'a R'y.	
" " Alburtis, " "	
" " Plymouth R. R., G. & N. Br.	
" " Connecting R. R. "	
" " Willow Street R. R.	
Total	

BITUMINOUS.

From Harrisburg	10,354 13
" Connecting R. R., G. & N. Br.	
" Junction R. R.	138 01
Total	10,492 17

COAL FOR COMPANY'S USE.

Anthracite	2,837 13
Bituminous	153 16
Total	2,991 09

RECAPITULATION.

	Total for Week.	Corresponding week last Year.	
Passing over Main Line and Leb. Val. Branch	10,480 03	34,500 18	d24,020 15
For Shipment by Canal	374 00	2,972 09	d2,598 09
Shipped Westward via Northern Central R. R.	5,983 10	2,209 10	i3,774 00
Shipped West or South from Pine Grove	967 09	508 15	i 458 14
Consumed on Laterals	1,476 05	1,856 13	d 380 08
Lehigh and Wyoming Coal		376 13	d 376 13
Total Anthracite paying fr'gt	19,281 07	42,424 18	d23,143 11
Bituminous	10,492 17	7,165 11	i3,327 06
Total of all kinds paying fr'gt	29,774 04	49,590 09	d19,816 05
Coal for Company's use	2,991 09	2,010 03	i 981 06
Total Tonnage for Week	32,765 13	51,600 12	d18,834 19
Since Dec. 1, 1870	766,869 01	808,951 05	d42,082 04
Total to date	799,634 14	860,551 17	d60,917 03

SHIPPED BY CANAL.

	Total for Week.	Corresponding week last Year.	
From Schuylkill Haven	128 00	—	—
" Port Clinton	—	—	—
Total Tonnage per Week	128 00	—	—
Since Dec. 1, 1870	36,225 17	—	—
Total to date	36,353 17	34,373 16	i1,980 01

Pennsylvania Coal Company,

Shipments of Pittston Coal for the week ending March 18, 1871.

	1871. WEEK.	1871. YEAR.	1870. WEEK.	1870. YEAR.
By Railway	233 01	3,241 11	11,476 00	184,021 17
" Canal	....	....	....	....
Total	233 01	3,241 11	11,476 00	184,021 17

Decrease 180,780 06 tons.

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending March 18, 1871, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL Tons. Cwt.
Total Wyoming	311 17	70,879 14
" Hazleton	852 14	207,368 02
" Upper Lehigh		442 06
" Beaver Meadow	946 11	74,521 16
" Mahanoy	5,373 12	81,577 19
" Mauch Chunk	143 11	1,739 10
Total Anthracite	7,628 05	436,729 07
Bituminous Coal from all sources	7,250 00	12,734 00
Total by rail and canal	14,878 05	449,463 07
Same time last year	34,828 14	753,464 01
Increase		
Decrease	19,950 09	303,940 14
Forwarded East from M'h Chunk by rail	6,887 00	373,716 09
Same time last year	32,110 15	663,501 02
Increase		
Decrease	25,223 15	289,784 13

RECAPITULATION.

Forwarded East from M'h Chunk by rail	6,887 00	373,716 09
To N. C. R. R., at Mount Carmel		18 00
Forwarded North from L. & B. Junction	60 03	34,221 10
To L. & S. R. R. at Packerton for rail	45 09	2,021 10
Delivered at M'h Chunk		
Delivered on line of road above Mauch Chunk	53 00	356 01
		3,363 11
Delivered above M. Chunk for use of L. V. R. R.	582 13	13,445 17
To L. & S. R. R., at P'n Hav., for railroad		94 10
Do. for canal		7,060 19
At M. Chunk for canal		2,451 02
Total Anthracite	7,628 05	436,726 07
Bituminous Coal	7,250 00	12,734 00
Total all kinds	14,878 05	449,463 07

Report of Coal Transported by the Lehigh Coal and Nav. Co.'s Railroads and Canals,

Week ending March 18, 1871–Compared with same time last year.

WHERE SHIPPED FROM	WEEK 1871., tons ct	WEEK 1870. tons ct.	YEAR 1871 tons cwt.	YEAR 1870. tons cwt.
Wyoming Region	1656 18	14462 05	54533 09	143722 12
Upper Lehigh Region		1346 19	4614 06	8352 16
Mahanoy Region				
Hazleton Region	10 07	313 01	843 04	1743 06
Beaver Meadow Region			1043 03	
Tresckow Region				
Mauch Chunk Region	139 01		17617 18	30089 18
Totals	1836 06	16122 05	78652 00	183308 12
Increase				
Decrease	14285 19		105256 12	
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	1559 04	10539 14	67128 02	158788 16
Forwarded East of Mch Chunk by Canal				
Delivered at and above Mauch Chunk	220 18	360 18	9430 12	7264 02
Delivered to L. & B. R. R. at Plymouth Bridge		4423 12		14646 01
L. V. R. R. at Sugar N.	56 04	798 01	2093 06	3209 13
Totals	1836 06	16122 05	78652 00	183308 12
Of the above there was transported on acc'nt of L. C. & N. Co.	139 01	827 04	18854 08	38979 15
W.-B. C. & I. Co.	1277 18	4089 07	38873 07	52561 17
Totals	1416 19	4916 11	57727 12	91541 12
Increase				
Decrease	3499 12		33314 00	

Report of Coal forwarded by Pa. & N. Y. R. R. Co., for week ending March 18, 1871.

	ANTHRACITE. Tons.	Cwt.	BITUMINOUS. Tons.	Cwt.
By Rail	60	03	4,391	12
Previously this year	34,271	01	56,150	07
Total by Rail	....	..	60,541	07
By Canal	....	..	....	..
Previously this year	....	..	....	..
Total by Canal	....	..	....	..
Total for the year	34,331	04	60,541	01
To the same time last year	40,942	01	33,914	00
Increase	6,610	17	26,627	07

Delaware and Hudson Canal Company.

The following is a statement of Coal transported by the Delaware and Hudson Canal Co., for the week ending March 18, 1871.

	WEEK.	SEASON.
By Del. and Hud. Canal		
By Railroad East	suspension.	48,332 00
" West		12,721 00
" South		
TOTAL TONS,		61,053 00
For the same period last year.		
By Del. and Hud. Canal		
By Railroad East	7,274 00	101,049 00
" West	956 00	20,183 00
" South	5,165 00	37,762 00
TOTAL TONS,	13,395 00	158,994 00

Shipments of Cumberland Coal

or the week ending Saturday, March 18, and for the year 1871:

SHIPPED BY	B. & O. R. R.	C. & O. CANAL.	TOTAL.
Cooke M.	.....	.....	.....
Borden	2,605 00	2,016 02	4,621 02
Consolidation	5,037 05	4,581 08	9,618 13
Spruce Hill	643 07	.....	643 07
Midlothian	1,584 06	1,504 01	3,088 07
H. and Baltimore	537 06	1,326 14	1,864 00
do Va M	1,919 00	.....	1,919 00
V C & I Co	1,383 14	.....	1,383 14
G. C. C. and I	2,381 14	727 13	3,109 07
Big Vein	2,356 19	.....	2 356 19
Maryland	2,716 10	5,191 07	7,907 17
American	1,810 10	8,5q2 09	53,62 19
Atlantic	1,414 02	.....	1,414 02
Piedmont	1,530 00	.....	1,530 00
Swanton	1,217 00	.....	1,217 00
Barton	754 00	.....	754 00
Potomac	1,298 00	.....	1,298 10
George's Creek M. C.	....	.....	.....
Franklin	1,882 12	.....	1,882 12
Total week	31,071 15	10,899 14	49,971 00
Previous	170,985 14	5,932 09	176,918 03
Total year	201,057 09	24,832 03	226,889 12

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

Company Coals.

March, 1871.

No quotations during strike.

	L.	Str.	Gra.	Eg.	Sto.	Ches
Scranton at E. Port	— —	— —	— —	— —	— —	— —
Pittston at Weehawken	— —	— —	— —	— —	— —	— —
Lackawana at do	— —	— —	— —	— —	— —	— —
Wilk'b're at Hoboken	— —	— —	— —	— —	— —	— —
Old Co. Lehigh at Pt. Johnston	— —	— —	— —	— —	— —	— —
Lehigh at E. Port	— —	— —	— —	— —	— —	— —

For freights to different points, see "Freights."

AT NEW YORK, March 25. SCHUYLKILL.	R. A.	W. A.	AT PHILADELPHIA, March 24. R. A.	W. A.
Lump	$— —	$— —	— —	— —
Steamer	— —	— —	— —	— —
Broken	— —	— —	— —	— to —
Egg	— to —	— to —	— —	— to —
Stove	— to —	— —	— —	— to —
Chestnut	— to —	— —	— —	— to —
Pea	— —	— —	— —	— —
LEHIGH.				
Lump, (along side)	— —	— —	— —	— —
Broken	— —	— —	— —	— —
Egg	— —	— —	— —	— —
Stove	— —	— —	— —	— —
Chestnut	— —	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*				
Diamond Vein	R. A. 8 00		— —	— —
New England	"		— —	— —
Locust Dale	W. A. 7 50		— —	— —
Honey Brook, Le'h	W.A. 10 00 to 12 00		— —	— —
Spring Mountain	" " 10 00 to 12 00		— —	— —
Sugar Creek	" " 10 00 to 12 00		— —	— —
Sugar Loaf	" " 10 00 to 12 00		— —	— —
Old Comp'y's	" " 10 00 to 12 00		— —	— —
Cross Creek	" " 10 00 to 12 00		— —	— —
Room Run	" " — —		— —	— —
Girardville	" " — —		— —	— —
McMichael	" " — —		— —	4 75
Shamokin	" " 7 50		5 25	4 75
Lykens Valley	" " — —		5 75	— —
Broad Top	" " 7 50		— —	— —
Hill & Harris	" " — —		4 75	— —
Henry Clay	" " — —		5 00	— —
Powelton	" " 7 50		— —	4 75

(*Dealers in these coals may be found in our advertising columns.)

Prices for Coal at Mauch Chunk.

March 1871.

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein f.o.b. at Phila.	$ —
" Lemon " "	—
Cumberland Vein Coal	—
Consolidation Coal Co.'s on board N. Y.	—
Maryland Coal Co. " "	—

Prices at Baltimore—March, 1871.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$— —
Pittston and Plymouth, do	— —
Shamokin Red or White Ash, do	— —
Lykens Valley Red Ash, do	— —
Zerba Valley	— —
Trevorton	— —
By retail, all kinds per ton of 2240 lbs.	— —
Georges Creek & Cumberland f. o. b. at Locust Point for cargoes	4 00@4 75
Fairmont and Clarksburg gas, f. c. b. at L. Point	6 00@6 50

Prices at Georget'n, D.C., & Alexandria, Va.

March, 1871.

George's Creek and Cumberland f. o. b. for shipping $4 75

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$— —
Lykens Valley	— —
Shamokin Red or White Ash	— —
Trevorton and Zerba Valley	— —

Prices of Gas Coals.

March, 1871.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 41-43 Pine st., N.Y.

	Duty, $1 25, gold Coarse	Block
Block House	$1 75	@ 75
Gowrie	1 75	@ 75

Corrected by Bird, Perkins & Job, 86 South street.

	Coarse.	Culm of Coal.
Pictou	$2 25	@1 25
Sydney	2 25	@ 80
Lingan	1 60	@ 80
Little Glace Bay	1 60	@1 00
Caledonia	1 60	@ 80

A discount from the prices of the coarse Coal on purchase of 1000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal. 25 per cent. ad valorem on the Culm of Coal.

AMERICAN.

	Currency.
Westmoreland	7 10 @7 25
Fairmount Gas Coal Co. of N. Y.	7 50 @— —
Despard Coal Co.	$7 50 @— —
Penn	7 75 @8 00
Newburg Orrel Gas	— — @— —
West Fairmount Gs Caoal	8 00 @— —

AT PHILADELPHIA.

Powelton	$7

Prices of Foreign Coals.

March, 1871.

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 32 Pine street New York.

Liverpool Gas Caking	$ 9 00@— —
" " Cannel	11 50@12 00
" House "	—@16 00
" " Orrel	12 00@14 00
Per ton 2,240 lbs., ex-ship.	
PRICES FROM YARD.	
Liverpool House Orrel, screened	$16 00@17 00
" " Cannel, "	18 00@20 00
Per ton 2,000 lbs. delivered.	

Freights.—March, 1871.

TO EASTERN PORTS.	From Philada.	From E. Port and Port Johnston.	From Newburg	From Rondout
Amesbury	$2 50	$2 00		
Bangor	2 50	1 60		
Bath	2 50	1 75		
Boston	2 70	1 85		
Bridgeport	1 75	1 00		
Bristol	2 00	1 40		
Cambridgeport	2 75	2 00		
Derby	2 00	1 20		
Dighton	2 50	— —		
East Cambridge	2 35	2 00		
Fall River	2 00	1 40		
Hackensack	1 75	1 00		
Hartford	2 50	1 50		
Jersey City	1 40	60		
Middletown	2 25	1 25		
Mystic	— —	1 25		
New Bedford	2 00	1 40		
Newburyport	2 65	1 85		
New Haven	1 90	1 00		
New London	1 76	1 25		
Newport	2 00	1 40		
New York	1 35	60		
Norwalk	1 80	1 00		
Norwich	2 00	1 30		
Nantucket	2 50	1 50		
Portland	2 30	1 50		
Portsmouth, N. H.	1 45	1 85		
Providence	2 00	1 25		
Rockport	2 10	1 65		
Saco	2 25	1 75		
Sag Harbor	1 70	1 20		
Salem	2 35	1 65		
Stamford	2 00	1 00		
Stonington	2 00	1 30		
Taunton	2 30	1 75		
Warren	— —	1 40		
Washington	1 25			
TO RIVER PORTS.				
Albany				
Catskill				
Cocksackie				
Coeyman's				
Cold Spring				
Fishkill				
Haverstraw				
Hudson				
New York				
Nyack				
Poughkeepsie				
Rhinebeck				
Rondout				
Saugerties				
Sing Sing				
Stuyvesant				
Tarrytown				
Troy				
West Point				
Yonkers				

Foreign and Provincial Freights.

March, 1871.

Closed for the winter.

Foreign.	
Newcastle and Ports on Tyne, per keel of 21 1-5 tons	£14 00@£15 00
Liverpool, 5 per cent primage	12s @16 ton.

TO NEW YORK.

Provincial,	
Sidney	$ —
Lingan	—
Cow Bay	—
Port Caledonia	—
Little Glace Bay	—

TO BOSTON.

Sydney	$ —
Lingan	—
Cow Bay	—
Port Caledonia	—
Little Glace Bay	—

Rates of Transportation to Tide Water.

Closed for the Season.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Port Carbon	$4 00
Less drawback of 50 cents on all Coal shipped east of New Brunswick and south of Cape Henry.	

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Easton	$1 84
C. R. R., N. J., Easton to Elizabethport	2 69
Shipping expenses at Elizabethport	25
Warfage	10
Total	$4 88

MAUCH CHUNK TO PORT JOHNSON.

L. V. R. R., or L. & S. R. R. from M. C. to Easton	$1 84
C. R. R., of N. J., Easton to Pt. Johnson	2 72
Shipping expenses	25
Warfage	10
Total	$4 91

TO HOBOKEN.

L. V. R. R., Mauch Chunk to Easton	$ —
Morris & Essex R. R. Easton to Hoboken	—
Shipping expenses	—
Warfage	—
Total	$ —

TO SOUTH AMBOY.

L. V. R. R. & D. R. R. & Cam. & Am. R. R.	—
Shipping Expenses	—
Total	$ —

PENN HAVEN TO ELIZABETHPORT.

L. V. RR. Penn Haven to Easton	—
C. RR. of N. J. Easton to Elizabethport	—
Shipping expenses	—
Wharfage	—
Total	$ —

METALS.

NEW YORK, March 24, 1871.

IRON.—Duty: Bars, 1 to 1¼ cents ₩ lb; Railroad, 70 cents ₩ 100 lbs.; Boiler and Plate, 1¼ cents ₩ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ₩ lb; Pig, 7 ₩ ton; Polished Sheet, 3cents ₩ lb; Galvanized 2½; Scrap Cast, $6; Wrought, 8 per ton,

	Store Prices.
Pig, Scotch No. 1, ₩ ton	32 00@34 00
Pig, American, No. 1	34 00@36 00
Pig, American, No. 2	32 00@34 00
Pig, American, Forge	31 00@32 00
Bar Refined, Englis and American	— —@75 00
Bar Swedes, assorted sizes (gold)	85 00@100 00

	Store Prices, Cash.
Bar, Swedes, ord'y sizes, less 5 ₩ ct	110 00@115 00
Bar, Refined " "	77 50@ — —
Bar, Common " "	85 00@ — —
Scroll " "	— —@ — —
Oval and half-round " "	100 00@120 —
Band " "	95 00@105 00
Horse Shoe " "	92 50@ 95 —
Rods, ⅜ to 3-16 inch " "	82 50@120 —
Hoop " "	100 00@140 00
Nail rod	— —@6¾ —
Sheet, Russia, as to Nos. (gold)	10½@—11
Sheet, Single, D. and T. Common	—4½@— 6
Sheet, Galv'd, Nos. 14 to 25 10 and 12c. Nos. 27, 28, and 29, 13@14	
Rails, English (gold), ₩ ton	54 50 @59 00
Rails, American, at Works in Pa	70 00 @72 00

STEEL.—Duty: Bars and ingots, valued at 7 cents, ₩ lb or under, 2½ cents; over 7 cents and not above 11, 3 cents ₩ lb; over 11 cents, 3½ cents ₩ lb, and 10 ₩ cent ad val. (Store prices.)

English Cast (2d and 1st quality) ₩ lb	— 15	@— 18
English Spring (2d and 1st quality)	— 7	@— 10
English Blister (2d and 1st quality)	— 10	@— 17
English Machinery	— 11½	@— 14
English German (2d and 1st quality)	— 13	@— 15
American Blister "Black Diamond"	— —	@—12
American, Cast, Tool do.	— 16	@— 17
American, Spring, do.	— 9	@— 11
American Machinery, do.	— —	@— 12
American German, do.	— 9	@— 12

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 2 cents ₩ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ₩ lb	— @— 30
Copper Bolts	— @— 32
Copper Braziers, 16oz. and over	— @— 32
Copper Nails	— @— 37
Copper, Old Sheathing, &c. clean	19 @— 20
Copper, Chili Pig	—@—
Copper, American Ingot	21¼@— 21¾
Yellow Metal, New Sheating	— @— 22
Yellow Metal Bolts	24 @— —
Yellow Metal Nails	— @— 22

LEAD.—Duty: Pig, $2 ₩ 100 lbs.; old Lead, 1½ cents ₩ lb; Pipe and Sheet, 2½ cents ₩ lb.

Galena, ₩ 100 lbs	$— @—
Spanish (gold)	6 20 @6 25
German, do.	6 20 @6 25
English, do.	6 20 @6 50
Bar (net)	— —@8 75
Pipe (net)	— —@10 25
Sheet	— —@10 25

Colwell, Shaw & Willard Tin-Lined Pipe 15 cts. ₩ lb.

TIN.—Duty: Pig, Bars, and Blocks, 15 ₩ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₩ cent.; Roofing 25. ad val.

	Gold ₩ lb.
Banca	38½@—
Straits	32½@33
English	—@32½

PLATES.

Pair to Good Brands.	*Gold.*	*Currency.*
I. C. Charcoal, ₩ box	$8 62½@9 00	$10 00 @10 50
I. C. Coke	7 25½@7 75	8 38½@ 8 75
Coke Terne	6 23 @7 25	7 25 @ 8 50
Charcoal Terne	7 75 @9 00	9,00 @ 9 50

REMARKS.

IRON.—The demand for Scotch Pig continues light, but holders still maintain their advanced views, the market closing steady at $32 @ 34, with small sales at these figures. There has been a fair inquiry for American, but the small quantity offering restricts business, and full prices prevail. 50 tons No. 1 Crane sold at $35, and 600 do. Nos. 1 and 2 Hudson, on private terms. In Wrought Scrap we notice sales of 275 tons, part to arrive, at a private price. There has been some inquiry for English Rails, and sales have been made of 4000 tons, on private terms. American are quiet but steady, at $70@72 currency; 100 tons old T sold on terms we did not learn. Store prices of Bar are unchanged, since the advance lately noticed, and if the present state of things continue in the mining region, a further improvement is looked for.

TIN.—There is little or no demand for Pig, and in the absence of business, prices are wholly nominal at, say for Straits and English, 23½ cents, and Banca, 38½c., gold; the London quotation on Saturday was for Straits £128 10s. Plates are selling moderately at the prices before current; the transactions embrace 500 bxs. Charcoal Tin and including extras at $8 62½c. for I. C.; 500 do. Charcoal Terne, $7 75 @ $8; and 800 do. Coke Terne, $6 @ $6 06½c. for B. C., up to $7 for good brands, all gold.

COPPER.—The manufactures of Copper and Yellow Metal are steady at our quoted rates. In Ingot, there is a little more business, but the market is devoid of anything like activity; the sales foot up about 150,000 lbs. Lake, at 21½c. a 21¾c., cash.

LEAD.—Pig remains dull, though prices are nominally as before, say $6 20 gold for ordinary Foreign. Bar, 8¾ cents; Sheet and Pipe, 10½c. cash, less 10 per cent. to the Trade, and Lin-lined Pipe, 15c, cash, less 2c. to the Trade.

STEEL.—Old prices for lots from store, continue; for, however values may vary from maker's hands, or cost to importers, store prices seldom change. The foreign article has the advantage of the market at present, especially for low qualities.

ZINC.—Spelter, foreign, 6c.. gold, per lb.; Spelter, domestic (Missouri), 7c., curr.; Sheet Zinc, foreign, 9c., gold; Zinc Paint, French, dry, 10c,, gold; do., American, 7c., curr.; Manganese (Pyrolusite), high grade, 4½a5½c.

Mining Stocks.

NEW YORK, March 24, 1871.

The following quotations are reported by the New York mining stock board:—

PETROLEUM STOCKS.

	BID.	ASKED.
Bergen Coal and Oil	20	40
Bennehoff Run	20	40
Blood Farm	30	100
Brevoort	40	100
Bliven Oil	25	50
Buchanan Farm	40	50
Central	71	73
Clinton	—	—
Home	175	200
Phillips Pet	10	20
Rynd Farm	32	35
United Petroleum Farms	18	20
United States	60	75
National	15	—
New York & Allegheney	60	150
Northern Light	40	100
Pinnacle Creek	60	100
Rathbone Oil	—	—
Second National	25	50
Sherman & B	—	—
Tarr Farm	29	—

GOLD STOCKS.

	BID.	ASKED.
Bates & Baxter	25	35
Benton	4	6
Black Hawk	20	40
Central Gold	13	15
Cons Gregory	50	60
Grass Valley	15	24
Gunnell	17	—
La Crosse	9	15
Liberty	1	3
Montana	3	—
Rocky Mount	3	5
Quartz Hill	18	25
Smith & Parmlee	37	42

San Francisco Stock Market.

A telegram from San Francisco March 23, quotes mining stocks as follows:—

Savage	80
Yellow Jacket	78
Kentuck	115
Chollar Potosi	71¼
Gould & Curry	65
Belcher	50
Imperial	44
Amador	35
Crown Point	145
Hale & Norcross	—

The Slate Trade.

The *Slatington News* gives us the following facts regarding the trade, quarries, etc., in that region:

The slate trade in this section begins to brighten up, and the prospects are that quite a fair business will be done during the coming summer. We see large preparations being made at a great many of the quarries for the summer trade, which we intend to speak of more fully hereafter, as work is commenced at the several quarries. The Heimback is one of the largest quarries in this section, and its beds of slate appear to be inexhaustable. The quarry has been worked to a certain extent all winter, but the Company has been giving its attention more particularly during the winter season, to the erection of buildings and machinery for future trade; they have erected an immense factory, about one hundred feet long by forty wide, and two stories high, and are fitting it up with the fastest improved machinery for the manufacture of flagging, mantels, school slate, etc., etc. The machinery is not yet all put into the building, but we notice that two saws and two planers were already in operation, and more were ready for erecting. About forty men are now employed in and about the quarry and factory, and so soon as the spring opens we believe the number will be increased to one hundred. We have mentioned but one of the many large quarries now preparing for the summer trade, and time will not permit us to mention others at present, besides we prefer seeing them commence business that we may be more fully prepared to speak of their business and prospects.

[Corrected weekly.]

(A "square" represents 100 superficial feet.)

PRICES OF ROOFING SLATE.

Vermont purple, 1st quality, per square	$6 50@ 7 00
" green, 1st " "	6 50@ 7 00
" red, 1st " "	15 00@16 00
" variegated, " "	5 75@ 6 20
d. b'k and d'k blue, 1st qual., "	6 00@ 7 05

PENNSYLVANIA SLATE TRADE.

The following is a weekly statement of Roofing Slates, School Slates and Mantels, shipped from Slatington, via Lehigh Valley Railroad for last week, ending March 18, 1871.

ROOFING SLATE.

Girard Slate Co	24 squares.
D. Williams & Co	24 "
J. Anthony	36 "
Lehigh Slate Co	100 "
American Slate Co	35 "
H. Williams	64 "
Columbia	53 "
Jones & Town	35 "
Total	371 "

SCHOOL SLATE.

D. Williams	6 cases.
Locke Slate Co	41 "
Lehigh Slate Co	71 "
Total	110 "

MANTELS.

Yerkes & Martin	— "
Lehigh Slate Co	11 "
Total	11 "

BLACK BOARDS.

Lehigh Slate Co	1 "

LEHIGH AND SUSQUEHANNA R. R.

Twin City Slate Co	35 squares.
Heimbach	35 "

MANTELS.

Lehigh Slate Co	3 cases.
Heimbach Slate Co	2 "

Lake Superior Copper and Iron.

The following tabular statement of the Copper and Iron business of Lake Superior, from 1845 to the year ending December 31, 1870, is published by Mr. J. R. DEVEREAUX, of the *Mining Gazette*, Houghton, Mich., who remarks: "The business on Lake Superior during the year 1870, both in the production of Copper and Iron, has been in excess of any previous year since the commencement of operations. The production of Copper from the mines of Lake Superior in 1871 will nearly reach as high a figure as it did in 1870. I confidently look for an increase in the yield of Iron and Pig Metal from the Marquette Iron District in 1871 over that of 1870. The monetary value placed upon the Copper and Iron, as noted in the following tables, is only approximately correct, as I find it quite impossible to furnish the accurate figures on this head."

PRODUCTS OF THE COPPER MINES IN 1870.

PORTAGE LAKE DISTRICT

Mines.	Tons.	Lbs.
Calumet-Hecla	8,792	1,393
Quincy	1,522	1,676
South Pewabic	662	1,327
Huron Copper Company	190	1,245
Isle Royal	34	345
Franklin	690	215
Pewabic	332	1,059
Schoolcraft	333	1,423
Hancock	166	730
Grand Portage	6	56
Total	12,731	1,469
Total in 1869	11,730	1,550
Increase	1,000	1,919

KEWEENAW DISTRICT.

Central	860	11
Copper Falls	515	659
Phœnix	759	251
Cliff	465	163
Amygdaloid	25	19
Total	2,624	1,097
Total in 1869	2,656	337
Decrease	31	1,240

ONTONAGON DISTRICT.

National	183	519
Minnesota	256	60
Ridge	155	1,100
Rockland	64	289
Evergreen Bluff	72	693
Caledonia	43	1,408
Flint Steel River	15	887
Aztec	16	1,755
Victoria	2	878
Mass	2	524
Adventure	2	15
Sundry Tributers from Sundry Places	12	1,365
Total	826	1,478
Total in 1869	901	1,596
Decrease	75	123

RECAPITULATION.

Portage Lake District	12,731	1,469
Ontonagon District	826	1,473
Keweenaw District	2,624	1,097
Grand Total	16,183	39
Grand Total in 1869	15,288	1,482
Increase in 1870	894	556

STATEMENT OF THE LAKE SUPERIOR COPPER PRODUCT FROM 1845 TO 1871.

	TONS.
1845 to 1854	7,642
1854 to 1858	11,312
1858	3,500
1859	4,200
1860	6,000
1861	7,400
1862	9,962
1863	8,548
1864	8,472
1865	10,791
1866	10,376
1867	11,735
1868	13,049
1869	15,288
1870	16,183
Total	144,458

APPROXIMATE STATEMENT OF INGOT COPPER PRODUCED AND ITS VALUE.

	TONS.	VALUE.
1845 to 1858	13,925	$2,000,500
1858	4,100	1,886,000
1859	4,200	1,890,000
1860	6,000	2,610,000
1861	7,500	3,337,500
1862	6,300	3,402,000
1863	6,500	4,420,000
1864	6,500	6,110,000
1865	7,000	5,145,000
1866	7,000	4,760,000
1867	8,200	4,140,000
1868	9,985	4,592,000
1869	12,200	5,368,000
1870	12,946	5,696,240
Total	112,386	$62,357,240

ASSESSMENTS AND DIVIDENDS.

ASSESSMENTS TO CONDUCT THE BUSINESS OF 1870.

Phœnix, October	$60,000

TABLE OF ASSESSMENTS LEVIED.

Adams	$100,000
Adventure	100,000
Ætna	140,000
Albany and Boston	615,000
Algoman	65,000
Allonez	118,000
American	20,000
Amygdaloid	410,000
Arnold	30,000
Atlas	40,000
Aztec	150,000
Bay State	385,000
Bohemian	343,000
Boston	45,000
Caledonia	140,000
Calumet	300,000
Central	100,000
Concord	120,000
Copper Creek	30,000
Copper Falls	510,000
Copper Harbor	20,000
Dana	68,000
Dacotah	56,500
Delaware	350,000
Devon	20,000
Dorchester	30,000
Douglass	130,000
Dover	20,000
Dudley	20,000
Eagle Harbor	80,000
Eagle River	85,000
Edwards	32,500
Empire	76,000
Evergreen Bluff	150,000
Everett	20,000
Flint Steel River	244,000
Franklin	370,000
Frue	50,000
Garden City	156,000
Girard	43,300
Grand Portage	50,000
Great Western	40,000
Hamilton	40,000
Hancock	530,000
Hanover	33,000
Hartford	30,000
Hecla	500,000
Highland	20,000
Hilton	50,000
Hope	22,000
Hulbert	15,000
Humboldt	100,000
Hungarian	20,000
Huron	500,000
Indiana	200,000
Iroquois	20,000
Isle Royale	910,000
Kearsarge	40,000
Keweenaw	100,000
Knowlton	160,000
Lake Superior	40,000
Madison	120,000
Mandan	65,300
Manhattan	110,000
Mass	98,800
Medora	38,400
Mendota	147,500
Merrimac	117,900
Mesnard	159,000
Michigan	40,000
Milton	30,000
Minnesota	436,000
National	110,000
Native	39,000
Naumkeag	20,000
North Cliff	110,000
Northwestern	227,300
Norwich	230,000
Ogima	140,000
Ossipee	70,000
Pennsylvania	500,000
Petherick	70,000
Pewabic	235,000
Philadelphia and Boston	24,300
Phœnix	820,000
Pittsburg & Boston	110,000
Pontiac	104,900
Quincy	200,000
Reliance	20,000
Resolute	51,000
Ridge	200,000
Rockland	340,000
Rhode Island	100,000
St. Clair	130,000
St. Louis	20,000
St. Mary's	110,000
Salem	10,000
Seneca	40,000
Sharon	2,000
Shelden and Columbian	460,000
South Pewabic '69	500,000
South Side	90,000
Ster	205,000
Superior	220,000
Toltec	420,000
Tremont	22,000
Victoria	85,000
Vulcan	30,000
Washington	20,000
West Minnesota	45,000
Winona	20,000
Winthrop	90,000
Total	$16,700,500

DIVIDENDS FROM THE EARNINGS OF 1870.

Hecla	$500,000
Calumet	300,000
Quincy	80,000
Central	50,000
Copper Falls	20,000
Total Dividends	$950,000
Total Assessments	60,000
Excess of Dividends over Assessments	$890,000

TOTAL DIVIDENDS DECLARED.

Hecla	$600,000
Calumet	300,000
Quincy	1,000,000
Central	420,000
Copper Falls	80,000
Franklin	220,000
Minnesota	1,760,000
Pittsburgh & Boston	2,280,000
National	280,000
Pewabic	380,000
Grand Total	$7,320,000

TOTALS OF LAKE SUPERIOR COPPER BUSINESS.

Proceeds Sales of Copper	$62,367,240
Proceeds from Assessments	16,706,500
Total Proceeds	$79,063,740
Returned by Dividends	7,320,000
Balance	$71,743,740
Percentage of Dividends to Total Proceeds	10.20 per cent.
Percentage of Dividends to Copper Sales	11.74 "
Percentage of Dividends to Assessments	43.81 "

Land Grants to Railroads.

THE territory already given to the Pacific railroads of this country is larger in area than that of France! It would accommodate the entire population of the United States. The land we have given to railway corporations in this country is greater by some thirty millions of acres than the united areas of France, Italy and the United Kingdom, which have an aggregate population of ninety millions of persons.

Polytechnic Club of the American Institute.

Meeting held at the rooms of the Association, March 16, 1871. The President (Prof. S. D. TILLMAN) in the chair.

The President (Prof. S. D. TILLMAN) read notes of Scientific Progress.

[These notes, together with the discussion thereon, will be published hereafter.]

IMPROVEMENT IN THE MICROSCOPE.

Dr. P. H. VANDERWEYDE said: I desire to say a few words in regard to some microscopic investigations which are of some importance. Many questions of the causes of disease are at once settled by the microscope; and so are many questions in mineralogy, botany, and all the natural sciences. Thus the improvement of the instrument has lately been much stimulated. Not only have the mechanical portion been much improved, but the optical quality of the lenses. The labor spent on some of the lenses of high power is enormous. It takes months to finish them, and they cost from fifty to two hundred dollars. Those made in the United States appear to be at least equal to foreign lenses. Indeed, it appears that you can be much more sure of uniformity of results by taking an objective of American manufacture, and it appears to be due to the greater fidelity of the American workman.

The test of lenses was once the dust upon the wings of butterflies. We have now got far beyond that. It has been discovered that a great many mineral deposits are remnants of the shells of animalcules. Chalk beds, and tripoli, though so fine as not only to look, but to taste like flour, the microscope reveals to consist of shells, millions upon millions to every cubic inch. The amount of these remains is so enormous, that if they were to be swept from the earth, the change upon the earth's surface would be greater than if all the remains of larger animals were to be entirely destroyed and removed. We have in South America and in California ridges two or three hundred feet high, and a hundred miles long, which would be entirely swept away.

By improving the lenses of the microscope, it has become possible to classify these shells; and a new trade has sprung up from their preparation and arrangement, for the study of these animalcules, which were undoubtedly the first trace of animal life, and of life in general, existing upon our globe. These are prepared for the microscope on slides on which there are 50, 100, and even 400 species of these shells, arranged in rows, the whole 400 occupying space not larger than the head of a pin, accompanied by a printed catalogue and description. How they are arranged is a mystery, and that they are arranged at all is a proof of the utmost dexterity. Find a hair which is split, cut off the end square, and then press the end upon glass, and the split will open. When it is raised from the glass it will close again. So it may be made to grasp a little shell, and in that way you may transport it. So it is necessary to "split hairs" in the study of these shells. (Laughter.)

Examining these little shells with the microscope, we see fine parallel lines upon them. By changing the light, another set of lines is seen crossing the former at an angle of 60°; and by again changing the light, a third set of lines is seen. After some time, it was discovered that these three sets of lines were not straight, but serpentine, and then that they were the intersections of hexagons. But still later it was ascertained that these were not hexagons, but little spherical balls standing at regular distances. Now, it appears that all the lines of diatoms are caused by these little balls, which are all silicious. But it is necessary that the light should be changed in its direction, and modified in various ways, in order to show all these details.

Usually the object is covered with a piece of glass as thin as letter-paper. Now we must have oblique illumination. Sometimes the minor was arranged to shift sideways, and sometimes a prism was placed to illuminate the object by total reflexion. I have adopted a different plan. I placed a piece of very thin looking-glass immediately under the object, and then, by illumination through an ordinary bull's-eye lens, such as is used in viewing opaque objects, I let the light fall upon the minor just below the object and a little one side, the side towards the lens, and be reflected so as to strike the object just at the angle I desired. With this arrangement I found that I could secure a very exact adjustment of the direction of the light.

Now as to the results. There has been a discussion about the *Arachnide discus*, which is a round disc resembling a spider's web in the lines visible upon it. Throwing the light upon it as I have described, I found that those lines are produced by little round balls, every one having its own shadow, and every one showing the little point which is seen in a transparent ball from the converging of the light to a focus, just opposite to the light, showing that each of these balls is a globe of flint or silex standing on the top of the shell. The minuteness of these little balls may be imagined, when I say that each of these discs—the whole being invisible to the naked eye—contains upon its surface at least six hundred of these balls of silex.

I will close with a curious discovery. Why are these objects covered with those flint balls? It has been discovered that silex, precipitated from fluo-silicic acid, when examined through the microscope, is seen to form the same little round balls visible on the diatoms, showing that they are produced, not by animal action, but by the crystallization of the silex itself.

Adjourned.

The London Metropolitan Railway.

TO THE EDITOR—SIR: Can you inform the public what is the price of stock and the rate of dividends of the London Metropolitan Railway? I have lately seen in New York papers statements that the work is highly profitable, but no precise reports; and I suspect that there are influences at work to keep the public in ignorance on the subject, in order that legislation on it may not be opposed and capital may be attracted. The Stockholders' Monthly Manual, at the end of January, on the eve of the February dividend, reported the last sale at 63¼. The preceding dividend was at the rate of .03¼ per annum; and if the coming one were at this rate the net price of the stock would have been .61⅛. I have never seen in New York papers any reports that could convey an idea that this work was so profitable. But I have met English engineers who are well acquainted with that work, who do not admit its alleged merits.

J. K. FISHER.

[We cannot give the present price of the stock of the London Metropolitan Railway; nor would the figures show the real condition of the enterprise, unless we could be sure that the capital represents accurately the cost of the work. It is an impression that this is not the case. Probably that road pays handsomely on its actual cost, even including the enormous expense which (if we remember correctly) was incurred in construction and for right of way. The heavy business and great public utility of the road are undoubted facts. But we do not advocate a hasty imitation of it here, as our article in another column shows.—ED.]

The Louisiana Sulphur Mines.

III.

THE first effort of the new company was directed to ascertain the dip of the several strata penetrated in the first well, and the extent of the bed of sulphur under the surface. Another artesian well, 150 feet distant from the old well, was begun in October, 1870, which in February, 1871, had reached the depth of 552 feet. A section of this well, as compared with the other, shows the following results:

163 feet, yellow and blue clay, with sand strata, soaked with petroleum.
181 feet, gray and yellow sand, with, gravel, soaked with petroleum.
3 feet, blue laminated clay.
40 feet, blue sandy limestone, in loose rounded fragments, stream of water, with gas and petroleum.
41 feet, white crystalline crumbling limestone.
112 feet, alternating strata of pure crystalline sulphur, and sulphur mixed with white limestone.
12 feet, white limestone mixed with white sulphur.

552 feet, depth of second well.

This experiment demonstrated the existence, at about the same depths, of the identical strata, and in the same order as were found in the first boring. The following facts have been established:

1st. The rock and the sulphur both underlie the surface in the direction of the new well.

2d. As compared with the first boring, the rock was found eleven feet lower down.

3d. The sulphur was found fifteen feet nearer the surface.

4th. The sulphur strata from a thickness of 100 feet increases to 112 feet in a distance, horizontally, of 150 feet.

5th. The sulphur is crystalline and pure, or nearly pure; portions of it being mixed with small quantities of crystalline limestone.

6th. The mine is of immense commercial value.

Upon what theory can this immense deposit of sulphur in this locality be accounted for? Is it of volcanic origin? The opinion of Prof. E. W. HILGARD, a geologist already known to fame, and who has been upon the ground, is entitled to great consideration. He says:

* "1st. The sulphur bearing formation consists of a superior stratum of friable crystalline limestone about sixty feet in thickness; beneath this lies the great sulphur bed, specimens of which I have seen naturally adherent to the limestone. This bed was found about one hundred feet thick, without perceptible change; it is pure, crystalline, semi-transparent, native sulphur. This huge mass might possibly be supposed to be a comparatively local accumulation from a volcanic source, were it not that

"2ndly. Beneath it there lie, for about one hundred and forty-five feet, alternating strata of gypsum and native sulphur; amongst them two beds respectively about five and ten feet in thickness; the latter ending at 690 feet. This interstratification of the two materials proves irrefragably their close relation and probable co-extension over a considerable area. The latter probability is strengthened by the fact that

"3d. From 690 to 1230 feet, the extreme depth to which the anger has penetrated, it has passed through one continuous bed of gypsum, of several varieties, the thickest bed of gypsum known, save one in Peru."

If, on the other hand, this formation be not of volcanic origin, can it be traced to natural causes? On this point a theory has been suggested by a learned chemist of Louisiana, whose modesty, ever the accompaniment of real talent, cannot long conceal his name from the public, which theory, whether right or wrong, merits grave consideration. He writes as follows:

** "My idea is that the sulphur was formed by the reduction of the gypsum, that is associated with it, by lignite. True, there is no lignite left on the spot, but that may be because it has all been used up, the gypsum being in excess. Lignite exists in many places in our State, and has disappeared from many others by natural decomposition into marsh gas. The Mississippi drift-wood, that is yearly buried in mud at the mouth of the river, undergoes this decomposition, and the resultant gas produces a pressure that raises the so-called mud-lumps at the passes. There are hillocks of mud, with bubbling springs upon their tops, which are continually bringing up more mud, until the weight of the mound so increases the pressure upon the gas beneath, that it bursts out in another place, and the mound remains springless. Now, such mounds dot the whole of Calcasieu prairie, much of the pine woods region, many flats in Bossier and Bienville parishes, etc., etc., and are especially numerous and high in the marsh surrounding the sulphur. Wherever they occur they are monuments of the burial of vegetable matter, and of its subsequent decay; so that we are not to expect lignite beneath them, but are yet to believe that *it has been there*.

"Now, if it has been and was in contact with the gypsum, its carbon would have united with the oxygen of the gypsum, making carbonic acid, part of which would unite with the lime of the gypsum, making common limestone, and another part would escape as a gas. More of the carbon would unite with the hydrogen of the lignite, and form marsh gas and olefiant gas. Much of these gases would escape, and make larger mud-lumps than usual. But pressure and contact would compel part to undergo a further change. Olefiant gas, marsh gas and water would form petroleum and carbonic acid, and the only constituent of the gypsum left would be the sulphur.

"I suppose the lignite to have occupied the place between the clay, rock and the gypsum, then much thicker than now, and that the limestone and the sulphur are of a subsequent date, and formed with the petroleum and mounds."

*Letter dated Oxford, Miss.; August 19, 1869, published in New Orleans *Times* September 12, 1869.

But whatever theory may be adopted as to the origin of the sulphur, there is no question that the value of the discovery is very great. A compendious statement appeared in the *American Journal of Science and Arts* for November, 1869, as follows: "As regards the sulphur bed, its practical importance can hardly be over-estimated. Its development, it is true, requires large capital and the best of engineering resources, in view of the depth and peculiar difficulties of drainage and ventilation; but who that knows the part that sulphuric acid plays in modern civilization, the monopoly enjoyed by Sicilian sulphur, the burdens naturally and artificially imposed upon its production in that island, and the inferiority of the acid prepared from pyrites, can fail to appreciate the intrinsic importance of a bed of pure sulphur one hundred and twenty-five feet thick, lying at a depth less than half of that at which some coal mines are profitably worked in Pennsylvania, and within ten miles of ocean navigation. The very gangue of the mineral, *gypsum*, is of sufficient value to agriculture and the arts to bear shipment for thousands of miles within the country." W.

Mining in Colorado.

BOULDER, COLORADO, March 4, 1871.

TO THE EDITOR—SIR: The branch railway from Denver to Boulder, 44 miles, is now completed, except 13 miles, to be built by midsummer coming. This road will bring to this section our share of visitors, settlers and capital, along with reduction works, to treat our numerous and rich lodes of gold, silver and copper ores. The coal, iron, lime, fire-clay, gypsum, fire sand-stone, etc., we have in abundance at our doors.

The first reduction works of importance erected in this county (except the Crosby Mill, which was not a success,) were those of Mr. A. Z. WILLARD, at Jamestown, 12 miles from this place. He dries the ores, crushes, pulverizes, roasts by dropping through a gas flame in a cupola furnace, and then amalgamates with Hepburn pans. He employs crude coal oil from which to generate gas, to obtain a pure and strong flame, though the ores of that district are full of sulphur. It does not look to an outsider like good economy, though to the initiated it may be. Prof. CROSBY thought his ores were roasted as well as could be, yet in his amalgamator something went wrong. Allow me to express the belief that iron on iron, as in the Hepburn and other similar pans and arastras, is what ails many mills and some batteries, that prevents amalgamation of minerals with quicksilver, and occasions the great losses complained of, both in working raw and roasted ores. I recommend lining such pans with hewn stone or composite stone, so as to prevent the electrical action that now flours quicksilver, and charges minerals treated so strongly as to cause the loss complained of.

Of Gold Hill District, 10 miles northwest, I have to say that but few parties are operating there, but they have been sucessful the past year, averaging over $1,000 each. One ten stamp mill and three arastras of stone constitute the amount of their reducing power. Four good lodes have been discovered and opened within a few months past, probably as good as any in the county. Several thousand dollars worth of gold ore has been taken from the best one this winter. The season has been a favorable one for mining, weather dry and mild, and provisions cheap; the only drawback being the winds, which have roared for weeks and months like forty thousand wild tigers or demons turned loose.

A few parties operate steadily in Ward District, 18 miles from Boulder, west, the year round, with fair success. There are five mills there—50, 15, 10 and 6 stamps respectively.

At Caribou (Grand Island District) 18 miles westerly and 6 miles south of Ward's, three or four companies have been raising ores energetically through the winter. These ores are chiefly of silver, and are hauled 18 miles south to Black Hawk for reduction. They are of high grade, from $100 to $1000 per ton average, chlorides and galena. A large force is now at work opening up a road on the water grade from Boulder to Caribou, to be done in three months.

You have seen the notice of the Chicago-Colorado Colony purchasing some nine townships of land in the valley portion of Boulder county, on which they will settle several hundred emigrants a few weeks hence. These lands comprise several sections underlaid with coal and iron, well watered, capable of irrigation, and all within about 12 miles of this place—the county seat. The railway route passes through a portion of them. Just here, then, is the place to locate the great reduction works of Colorado, as well as the centre of the iron manufacture for pig metal, castings and rolled work, as well as nails and shelf hardware. Bar iron, stoves, ploughs, nails, hammers, axes, hoes, etc., are now wanted in quantity. There would be no end to the quantity and quality of precious metal ores mined in this county, if some company of capital would put up good reduction works at this location and buy the ores at fair rates.

J. A. H.

THE ENGINEERING AND MINING JOURNAL.

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ROSSITER W. RAYMOND, Ph. D., Editor.

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Quick Transit in Cities.

THERE is in the Legislature a sudden rush for charters for steam railways in New York city. One applicant asks that the city shall build and operate a railway from the Battery to Harlem river, and charge only five cents fare for any distance on it; and it is said that another has powerful supporters, who will favor its construction by the city if private capital cannot be got for it. We have for some time noticed, in leading city journals, articles recommending the building of railways at the cost of the city, if they cannot otherwise be built. In opposition to such schemes, there are renewed efforts, in England and here, to revive steam locomotion on roads, streets, and street railways or tramways. Sir JOSEPH WHITWORTH decidedly advocates this way of getting the rapid and cheap transit desired, and explains the failure of steam to establish itself on roads, by saying that there have been "many obstructions, for many years past, to the employment of road locomotives." In this country there are several small steam carriages, which work well enough to show that economical and efficient carriages may be built; and, it is said, carriages will be built on stipulations, as to performance, which will give reasonable assurance against loss.

Last week, at the Polytechnic Club, Mr. J. K. FISHER showed a design of a steam omnibus, for twenty-eight passengers, which will run on and off the grooved rails used in this city—running over the pavements when making short curves, or turning round at the termini, or going around blocks to avoid obstructions in the streets, but running on the rails where the track is straight and free. The wheels are without flanges, cylindrical, and five or six inches wide, except a pair of light pilot wheels, which are gauged to run in the grooves. It is questioned, by some engineers, whether the main wheels will follow the pilot wheels, on straight tracks. The majority say they will. The dissent of the minority may help to explain why this expedient to get round sharp curves has not been proposed before.

Mr. FISHER has no doubt that steam carriages can work economically on pavements; so economically that it would not pay to lay rails for them, where the pavements are of the better class; but where rails are already laid, it will be expedient to use them in this way. A higher speed may safely be allowed, where the rails define the path of the carriage, than where the carriage runs at large on a pavement. How much higher speed, is a question for trial and observation; but a carriage with two-thirds of its weight on its drivers, and engines capable of applying all its adhesion, can probably work safely at twelve miles an hour for nearly all the distance it runs. If this should prove to be the case, the proposed underground railways will be of insufficient use to pay their cost, for their speed cannot average twelve miles an hour. On the Metropolitan Railway, with stations ⅛ths of a mile apart, the average speed is 12½ miles an hour: here it is proposed to put the stations ½ a mile apart, which will reduce the average to 11⅛ths miles per hour. Moreover, the Metropolitan is a third in open cuttings, in which the steam-blast is used, and steam made freely, the dampers being closed, and the steam condensed, in the tunnels: here it is proposed to go all the way in tunnels or under bridges, with no ventilation but through lamp-posts, or the areas under windows, a condition which will render speed incompatible with the degree of purity of air that will be insisted on, even by the most long-suffering of passengers. All things considered, the view that steam engines on the surface can with safety more than equal the average speed on underground railways, is worthy of a practical test, before twenty millions or more are spent on imitations of roads like the London Metropolitan.

Of course we do not mean to be understood as advocating the immediate running of steam carriages at twelve miles per hour, or at any other speed, upon our most crowded streets. That would be to do what has been too often done already—add another element of confusion to the multitude of intolerable nuisances that now afflict us. When steam carriages are put on, something must be taken off, to make room for them; and that something might be, for a beginning, the horse-cars.

A just estimate of steam carriages cannot be formed by merely imagining their performance on pavements made for horses. To estimate them fairly, we must imagine pavements made for them. Mr. FISHER proposes that the undergrade streets, now proposed for railways, shall have cast-iron floors, and that steam carriages shall run in them. The advantage will be, that a carriage loaded for the upper part of the city can run through without stopping, at the highest speed of which it is capable; whereas, on the Metropolitan, every train stops at every station. At first, when there is but one such street, the speed will have to be moderate when meeting carriages, lest a collision should be disastrous: but when there are two such streets, one may be for the upward and the other for the downward bound carriages, and collisions of carriages overtaking each other will be comparatively harmless. The way carriages, before stopping, or much abating their speed, will turn out and get close to the side of the street, so that the through carriages may run straight forward at full speed.

Supposing this arrangement complete—two streets, worked by one company, under one superintendent—what rate of speed may be expected? In the old railway books we find tables showing the comparative resistances on rails and canals; and the resistances on rails were given as constant at all speeds. This was soon found to be erroneous; instead of eight pounds per ton, the assumed resistance at all speeds, eighteen pounds were found at 30 miles per hour, and twenty-nine pounds at 60 miles. A small part of this increase was due to the atmosphere, and the greater part to the friction of the cones and flanges of the wheels. Steam carriages with cylindrical wheels will not be subject to this kind of friction, except upon curves. On floors as level as rails, they will have no considerable increase of resistance; and the theory of the early railway engineers will probably prove true with respect to them. We may, therefore, expect a higher speed than is possible on rails. As to the danger of such speed, without some surer guide than the steering gear of a steam carriage, there is not yet much agreement; experience will in time determine it; but if the steering gear be inadequate, there may be grooves in which light pilot wheels will run, as wagon wheels often run in the grooves of street rails.

Railway reformers, such as Mr. BRYDGES ADAMS and Mr. ROBERT FAIRLIE, have long complained of the heaviness of railway engines and carriages; but there is a reason for such heaviness, which does not apply to carriages that run singly. If a locomotive break down, it will plunge into the ground and stop suddenly, and the train will dash against it and be broken up; but if a single carriage break down, on a smooth floor, it will slide along until friction stops it, and no serious harm will ensue; steam carriages, therefore, may be much lighter, and worked with less cost for power and repairs. The saving of repairs of road and machinery, and of fuel, will in a great measure, if not fully, compensate for the excess of cost of many small engines over a few heavy locomotives.

Another advantage of this system, of light carriages and few stops, is, that it will save much of the cost of stopping and starting. Mr. A. F. SMITH, when superintendent of the Hudson River railway, estimated that it cost $1.25 to stop and start one of its passenger trains, weighing 128 tons. This is nearly one cent per ton. As it is desirable to get a high maximum speed on city lines, lessening the number of stops and the cost of each stop will have an important influence on the profits.

If the general views of the advocates of steam carriages be well founded, we may immediately employ them profitably for some kinds of work; and practice in building will cheapen them, so that their use may be extended, and in time they will be cheaper than horses for other kinds of work. Pavements will then be made smoother, which will still further increase their economy, until all work can be done by them cheaper than by horses; and horses will be used only for pleasure. It is held by some of their advocates, that even now, on roads made for horses, small steam carriages can work more economically than horses, at the speed required by men whose time is of much value.

It would leave this sketch incomplete to omit the question of cleanliness. On iron floors, or rails with pavements to keep down the dust, steamers will make no dirt; and on stone they will make less than a sixth as much as horses make. The consequence of this system will, therefore, be a diminution of dirt as the system advances; and, in time, an almost perfect cleanliness.

We have not treated this question as settled; but it certainly seems to us worthy of more careful consideration than it has received at the hands of our engineers.

The Rigi Railway.

SOME interesting details concerning this somewhat remarkable engineering enterprise were given recently in the German Association for the art of railroad building, (Verein für Eisenbahnkunde) by an engineer named WEIDENFELD. The railroad commences at Vitznau on the Lake of Lucerne, passes through a portion of the village with a grade of one foot in twelve and a half, and after passing through it takes a grade of one in four. The road passes along the edge of a precipice, on a continually ascending grade, to Rigi-Staffel, which is the present terminus. For a portion of the distance the roadway is notched into the side of the precipice, but occasionally little ravines are either filled in or the road carried across them on bridges. In one place a bridge over a small torrent has a grade of one in four and a curve of six hundred feet radius.

The road is provided with three rails. Those on the outside weigh about thirty pounds to the yard, and do not differ from those in ordinary use. The center rail is, however, provided with teeth into which the cogs of the center wheel of the locomotive work. This rail is composed of two pieces placed at the proper distance apart and kept in position by bolts which form at the same time the teeth of the rack. The longitudinal expansion of the rack caused considerable difficulty as long as the attempt was made to allow for it between consecutive rails, but now the allowance is made at greater distances and no difficulty experienced.

The boiler of the locomotive is so arranged as to be vertical when the engine is standing on the steepest grade, and it is always placed on the lower side of the train. An ordinary train on this road consists of the locomotive, one passenger car and one open freight car. The passenger car carries passengers on top, and in this way is made to accommodate eighty persons.

The motion of the train is said to be uniform except in ascending the easiest grades, and the train can be quickly stopped at any desired point, even when in rapid motion downwards, by the brakes and by the compression of air in the cylinders. The ordinary speed on the upward trip is about four miles per hour; a very fair speed, considering the steepness of the grades.

Weisbach.

LAST week we announced the death of Prof. WEISBACH, the news of which we received so late that we were unable to prepare a notice of his life and works in time for publication in that number. He was so well known in this country, not only to his old pupils, but also to the whole engineering world, that the announcement of his death will doubtless be a source of sincere regret to many of our readers.

JULIUS LUDWIG WEISBACH was the son of a mining official, and was born on the 10th of August, 1810, at Mittelschmiedeberg, near Annaberg, in Saxony. He entered the Mining Academy at Freiberg in 1822, and upon the completion of his course there, studied at the Universities of Göttingen and Vienna. Upon the death of Prof. HECT, of the Freiberg Academy, in the spring of 1833, WEISBACH completed the courses upon "*applied mathematics*" and "*the construction of mining machinery;*" and in the same year he became personally attached to that institution, lecturing regularly on those subjects. In 1835 he undertook, in addition, the course on "*mining surveying*" (Markscheidekunst), and by his genius made it what it now is, one of the most important studies of the Academy, and almost an exact science. In 1842, Prof. NAUMANN having been called to the University of Leipzig, he undertook the course on crystallography. In 1851 he began to lecture on descriptive geometry, a subject which had not previously been treated separately at the Academy. About 1858 he began to lecture upon the construction of machines, the course being divided into two parts, one theoretical and the other practical. At the same time he changed the course on crystallography into a course on mathematical crystallography, and introduced another course, viz., "theoretical optics," relinquishing descriptive geometry to Prof. JUNGE. Upon the death of the latter, two or three years ago, he assumed the entire charge, with the aid of his son-in-law, of the whole subject of mining surveying, the theoretical part of which had always remained in his hands.

He died at a quarter-past four o'clock in the morning of February 24th, 1871, at Friberg, in the sixty-fifth year of his age, having taught for thirty-eight years in the Academy at that place. Such is a brief history of his career as professor; but it is not only as a teacher, but also as an author and experimenter, that he distinguished himself. He was a most prolific, popular and scientific writer upon many branches of engineering, and when he died he was undoubtedly the greatest authority upon the subject of hydraulics, to which he had always given great attention. It would be impossible in the space at our disposal to give even the full titles of all the works and papers which he has published, and we shall, therefore, mention only the most important. His greatest book is his "*Mechanics*," which first appeared in 1846, and has since passed through four editions in German; it now forms a work of three volumes, covering nearly four thousand pages. It has been translated into Russian, Polish, Swedish and Italian, and three editions of it have appeared in English. Among his other works we may mention the "*Ingenieur*," a very valuable resume of formulas, tables, etc., for engineers; the "*Neue Markscheidekunst;*" "*Experimental-hydraulik;*" "*Axonometrische Zeichnung*," a great improvement on isometrical perspective; the "*Handbuch der Bergmaschinenmechanik;*" the "*Leitfaden zum Unterricht in der niedern Mathematik;*" and the "*Tafel der vielfachen Sinus und Cosinus.*" He also wrote several extremely valuable articles for the "*Allgemeine Maschinen-encyclopädie*," of Hülsse, upon various subjects connected with mechanics. He contributed an almost incredible number of papers to the various German engineering periodicals, principally however to the *Ingenieur* (afterwards the *Civilingenieur*) of Freiberg. By far the largest number of the latter were upon questions connected with the mechanics of fluids, the rigidity of ropes, and experimental mechanics for the lecture room. We have now to consider Prof. WEISBACH as an experimenter and original investigator, particularly in the department of hydraulic engineering; here he undoubtedly stood without a rival. The experiments made by him to determine

the co-efficients for the efflux of water under different circumstances, for the efflux of air, for the flow of water through pipes, etc., and also with a view of studying the force of water due to pressure, impact, etc., are numbered by thousands. It was he who first introduced into calculations in hydraulics what is known as the "*coefficient of resistance*," by means of which such computations are often very much simplified. He aided greatly in bringing that branch of mechanics to its present condition, and at his death was probably the greatest authority upon any question connected with it. Another branch of mathematical science to which he devoted himself was geodesy.

In addition to his lectures and work (*Die Neue Markscheidekunst*) he had prepared but not published a text-book on mining surveying. To him was confided the task of making the triangulation of Saxony for the purpose of measuring, in connection with the other German States, the length of a degree in Central Europe. He also made the surveys and triangulation for the *Rothschönberger Stollen*, which is to be the longest tunnel or adit in the world.

This brief and imperfect review of what Prof. WEISBACH has done may afford some idea of his ability and industry in the various branches of science, to which he devoted himself, but it can convey no conception of the wonderful clearness of his mind, which made him so pre-eminent as a teacher not only in his lectures, but also in his books. He seemed to have an intuitive perception of the difficulties in the way of students of science, and the whole energies of his great mind were directed, with how great success those who have studied under him can best understand, to smoothing their path. Students, when perplexed, always found him ready and anxious to explain all difficult questions. No matter how stupid the inquiry or inquirer, WEISBACH'S only answer was a simple and often beautiful demonstration of the problem in doubt. To any one interested in the subject in hand, his lectures were an intellectual treat.

A scene, that occurred when we were studying at Freiberg, will give some idea of the manner in which he became interested in his subject when lecturing. Becoming entirely absorbed in a problem in theoretical optics, which he was working out on the blackboard for the class, he gradually got the sponge under one arm, the ruler under the other, began to write with both hands, suddenly put his notes from which he was copying some figures in his mouth, and finished in that condition one of the most beautiful demonstrations we have ever listened to. Not a student smiled, and it was not until he had finished the problem that we became aware of the ludicrous features of the situation.

We who have known him intimately can well appreciate the loss which science has sustained, yet our grief is much greater, when we think of him as a man, of his kindly disposition, of his singleness of purpose, and of his great goodness of heart. How often a student has gone to him for advice or assistance, and how they have always found in him a true friend, no matter how poor and unknown they may have been, the world will never know. All the students loved him, and none of his old pupils in America will hear the sad news of his death without dropping a tear on dear old WEISBACH'S grave.

He leaves a son, already quite a distinguished professor in Freiberg, and two daughters, one of whom resides in Lasalle, Illinois.

Barker's Chemistry

A TEXT-BOOK OF ELEMENTARY CHEMISTRY, *Theoretical and Inorganic*. By GEORGE F. BARKER, Professor of Physiological Chemistry in Yale College. New Haven, C. C. Chatfield & Co. 12mo. 342 pp.

THE fine paper, clear type and neat illustrations of this volume pre-disposed us to a favorable judgment, before we had examined its contents. It is fit to lie on a gentleman's table, or stand in good company upon his shelves, instead of being relegated, like most school-books, to the garret. All of us have learned by experience that the geography, arithmetic or chemistry we studied at school, however imperfect as compared with more elaborate works, is the one we can most conveniently consult in after years. Some preposterously simple elementary fact has escaped our memory, and we must hunt for it in a cyclopedia; but we know just where it was in the manual of our youthful days; so out of the garret rubbish we extract our old friend, and sigh to think he is so tawdry and vulgar in appearance that he cannot be kept in the library. We do not refer to the dog's-ears and blots of early usage; for we would gladly get a new copy as a substitute for the war-worn veteran; but the coarse, cheap, sleazy style would look all the worse for novelty—and back goes shoddy to the garret. All honor to the publishers who, in these days of "cheap and nasty" school-books, have the good sense to recognize in such a publication the laws of taste, as well as the requirements of science!

The outside of Prof. BARKER'S book invites perusal, and the inside repays it. We fancy, however, that it will be more welcome to chemists than to beginners in chemistry. Its title and arrangement declare it to be intended as a manual of instruction; but the first part is singularly mal-adapted to such a use. It is certainly unwise, if not utterly impracticable, to put a student through the dry and abstruse complexities of atomicity and molecular structure, before acquainting him with the facts of which these laws are but hypothetical explanations. It is putting the subject wrong end foremost. The cart before the horse is absurd enough; but this is the harness before either.

On the other hand, the first eighty-four pages of this book, regarded as a condensed exposition of what is called the modern chemistry, intended for the use of those who are acquainted already with the science as formerly expressed, are indeed admirable. Nothing can be neater than the following tabular view of molecular structure, to connect the old system with the new:

Molecules.
- Like Atoms ..... Element.
- Unlike Atoms
  - United directly ..... Binary.
  - United indirectly
    - By a Dyad
      - — R and H ..... Acid.
      - — R and H ..... Base.
      - — R and +R ..... Salt.
    - By a Triad
      - — R and H ..... Amide.
      - — R and H ..... Amine.
      - — R and +R ..... Alkalamide.

Of course, the modern chemical nomenclature is followed throughout. It is useless for us poor fellows who graduated in the old school to protest against a change which forces us to go to school again; for the new names do not constitute the revolution; they merely symbolize far deeper changes in theory, which rest upon two discoveries: first, that the laws of chemical equivalence are not simple, but complex, or, as the atomists would express it, that each element has not only a fixed and definite atomic weight, but that atoms of certain definite weight have also fixed and definite laws of equivalence, combining singly, or in pairs, triplets, etc.; and secondly, that substances may be shown by analysis to have the same constitution, but widely different qualities, or, speaking atomistically, that the grouping of the atoms in a compound is of as much importance as their number or nature. The results of these discoveries are the classification of the elements in different groups, called monads, dyads, triads, tetrads, pentads, hexads, and heptads, in proportion as their power of combination enables them to combine with 1, 2, 3, 4, 5, 6, or 7 atoms of another element; secondly, a double way of writing the formulæ—the one analogous to the old style, but modified, and another way, in which the different position of the symbols give a hypothetical representation of the peculiar arrangement of the atoms in any compound. So the formula $S_2 O_5$ ($H_2 O$), or, as it is now written, $H_2 S_2 O_6$, which stands for the variety of sulphuric acid containing an excess of sulphur, and called dithionic acid, is graphically thus represented, giving an idea of the grouping of the atoms:

$$HO - S\overset{O}{\underset{O}{\|}} - S\overset{O}{\underset{O}{\|}} - OH$$

All this is succinctly set forth by Prof. BARKER, though without any hint of the arguments to support the new theory, and, still more unfortunately, without sufficient recognition of the old. The table of symbols and atomic weights is not accompanied with any comparitive view of the formerly accepted numbers, some thirty-six of which have been doubled, to satisfy the modern theory, while twenty-seven are left unchanged. There is even no reference to ODLING'S table, in which nine of the elementary equivalences were doubled, to correspond with the type theory. Nor does the second part of the book furnish the means of comparing old and new formulæ, except in a few cases. Stoichiometrical calculations upon these incomplete data are annoyingly difficult; and we need hardly say to Prof BARKER that the prime requisite to the general use of the modern theory, its names and its equations, is the presentation of it so that chemists *can* use it. Let him add to this volume an index of only the principal compounds or inorganic chemistry, their old and new names and formulæ, and a table of the atomic weights corresponding to the old theory; then let him put in the appendix the tables of symbols, electro-chemical relations, and atomic equivalence, which are now smothered in the text; finally, let him add tables of density and diffusibility—and we will ask nothing more to make this book a welcome companion for the chemist of either school. We will forgive him the barbarous word *chemism* for chemical attraction (doubtless formed on the bad model of *magnetism*, which was originally but an *ism*, and should have lost its tadpole tail when it developed out of what Prof. BARKER might call embryism). We will forgive him the cruel declaration that 0.0896 grains make one *crith*—the weight of one liter of hydrogen. Indeed we do not charge him with the paternity of either *chemism* or *crith*. Probably he has adopted the ugly brats because he knew and respected their real father; and the second being, so far as we know, the only name for the thing, may be entitled to its execrable existence. We will forgive—but we don't see anything more to forgive; and we are free to throw down the critical microscope, and express our sincere admiration at the marvellously compact, symmetrical and logical exposition which Prof. BARKER has given of the nature, principles and relations of modern chemistry.

The second part of the book is about as good as it can be, consistently with its brevity. It is excellently arranged, clearly expressed, handsomely illustrated, and, above all, fully up to the latest discoveries, and not lagging a generation behind, as too many of our school books do. If Prof. BARKER had been a professional book-maker, and CHATFIELD & Co. had been publishers of long standing, with no end of second-hand cuts to be "worked in," and school "series" to be conformed to, and country customers to be gratified with cheap extracts and essences of science, we should have had, what we have not, thank fortune! another piece of slop-work. As it is, we can heartily recommend this book to the teacher, with but one or two cautions as to its use:

1. Don't be scared by the hard words at the beginning. Master them yourself, and then let the boys skip them till you can lay a foundation of facts for them.

2. Accompany your instruction with ample explanation and illustration, using this book merely as a trustworthy and well-considered scheme or syllabus.

It is folly to persevere any longer in the use of the old system. Our young chemists must unlearn it, if we are so lazy and timid as to train them in it. The sooner the change is made the better; and we know of no better assistant in the unpleasant work than Prof. BARKER'S book affords.

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112,723.—MODE OF ATTACHING SEATS TO WAGONS.—Joseph L. Linville and William Shimanour, Findlay, Ohio.
112,724.—PERMUTATION-LOCK.—Samuel Loyd, New York, N. Y.
112,725.—MANUFACTURE AND TREATMENT OF ALCOHOLIC SPIRITS.—Orazio Lugo, Baltimore, Md.
112,726.—COOLING AIR IN THE MANUFACTURE OF ICE.—Orazio Lugo and James B. McPherson, Baltimore, Md.
112,727.—COMBINED BAG-HOLDER AND FILLER.—William F. Lum, Waterloo, Wis.
112,728.—COMPOUND FOR LUBRICATING WOOL.—John James Lundy, Leith, near Edinburgh, North Britain.
112,729.—DRESS-SWORD.—James M. Mason, Washington, D. C., assignor to Alexander & Mason, same place.
112,730.—PUMP.—Benjamin Franklin McKeehan, Clarksburg, W. Va.
112,731.—HOSE TUNNEL FOR CITY RAILWAYS.—Laurence Myers, Philadelphia, Pa.
112,732.—COMPOUND FOR DESTROYING POTATO BUGS.—Lemuel Pagin, Niles, Mich.
112,733.—MACHINE FOR GRINDING WOOD PULP.—Sanford A. Perkins. Topsham, Me.
112,734.—WOOD PULP MACHINE.—Sanford A. Perkins, Topsham, Me.
112,735.—ROLL FOR HUSKING CORN.—Peter Philip, Stockport, N. Y.
112,736.—DEVICE FOR PREVENTING BACK-LASH IN MACHINERY.—John L. Post, Ashley, Pa.
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112,738.—POLISHING COFFEE.—John T. Randall, Baltimore, Md.
112,739.—WASH-BOILER.—Henry R. Robbins, Baltimore, Md.
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112,742.—BEER-COOLER FOR BEER ON DRAUGHT.—Hugo Sell, New York, N. Y.
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112,744.—SEWING-MACHINE NEEDLE.—John J. Sibley, New York, N. Y.
112,745.—SEWING-MACHINE.—William Sidenberg, New York, N. Y.
112,746.—SUSPENDER.—Sydney E. Smyth, Washington, D. C., assignor to himself and Frederic G. Ford.
112,747.—SEWING-MACHINE.—Greenleaf Stackpole, Elizabeth, N. J.
112,748.—FLORAL-BRACKET.—Elizabeth Mary Stigale, Philadelphia, Pa.
112,749.—HAIR-RESTORATIVE.—William P. Thomas and Joseph F. Boardman, Elko, Nevada.
112,750.—HARVESTER.—Ansbert H. Wagner, Chicago, Ill.
112,751.—APPARATUS FOR DISTILLING PETROLEUM AND OTHER LIQUIDS.—William Gray Warden, Philadelphia, Pa.
112,752.—MACHINE FOR CUTTING TEXTILE AND OTHER MATERIALS.—Albin Warth, Stapleton, N. Y.
112,753.U-FASTENING FOR TEXTILE FABRICS.—Albin Warth, Stapleton, N. Y.
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112,755.—APPARATUS FOR VULCANIZING RUBBER.—Henry W. Weicker, Woonsocket, assignor to himself and George W. Miller, Smithfield, R. I.
112,756.—SHUTTER-FASTENER.—Peter L. Weimer, Lebanon, Pa.
112,757.—CARRIAGE-AXLE.—Edward Wells, New Haven, Conn.
112,758.—LANDAU CARRIAGE.—Edward Wells, New Haven, Conn.
112,759.—LATHE-DOG.—Henry K. White, Chelsea, Mass.
112,760.—WASH-BOILER.—Wolcott B. White, Rome, N. Y.
112,761, antedated March 6, 1871.—PORTABLE STEAM GENERATOR.—James E. Woodruff, Buffalo, N. Y., assignor of one-half his right to James F. Rowley, same place.
112,762.—GATE.—Claiborne Wright, Mason, Ill.
112,763.—BREECH-LOADING FIRE-ARM.—William C. Dodge, Washington, D. C.

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112,764.—COMPOSITION FOR PAVEMENTS.—Nathan B. Abbott, Brooklyn, N. Y.
112,765.—BED-BOTTOM.—John H. Allyn, Whitesborough, N. Y.
112,766.—PRESSING AND BALING HAY.—George H. Aylworth, Brighton, Ill.
112,767.—HAT AND CAP-HOLDER.—C. Beeny, Albany, N. Y.
112,768.—PUMP-PISTON.—Daniel W. Bell, St. Louis, Mo.
112,769.—HORSESHOE-MACHINE.—Uriah Billings, Cambridgeport, Mass.
112,770.—PISTON-ROD PACKING.—James H. Blessing, Albany, N. Y., assignor to himself and Frederick Townsend, same place.
112,771.—TAP AND NOZZLE FOR OIL-CANS.—Jabez A. Bostwick, New York, N. Y.
112,772.—GLASS-BLOWER'S MOLD.—Samuel R. Bowie, New Bedford, Mass., assignor to himself and William L. Libbey Brother, same place.
112,773.—HORSE-SHOE.—Joseph Brackett, Lynn, Mass.
112,774.—STREET-LAMP.—George Brandon, New York, N. Y.
112,775.—MACHINE FOR UPSETTING BOLTS.—Benjamin Briscoe and Joseph A. Briscoe, Detroit, Mich., assignors to The Michigan Bolt and Nut Company, same place.
112,776.—GREEN GLAZE FOR FLOWER-POTS.—John E. Brooks, Yarmouth, Me.
112,777.—HORSE HAY-FORK.—Benjamin F. Brown, Catlin, Ind.
112,778, antedated March 9, 1871.—DEVICE FOR TRANSPORTING EGGS.—Abner H. Bryant, Chicago, Ill.
112,779.—PNEUMATIC TELEGRAPH.—Edward A. Calahan, Brooklyn, and George B. Field, New York, N. Y.
112,780, antedated March 18, 1871.—COMBINED GAUGE AND TRY SQUARE.—Frederic Castle, Montana, Iowa, assignor to himself and N. J. Eaton, same place.
112,781.—PEN-HOLDER.—Benjamin Charles, Akron, Ohio.
112,782.—THRASHING-MACHINE.—F. G. Chesman, Lemont, Ill.
112,783.—THILL-COUPLING.—N. J. Clark, Clarkston, Mich., assignor to himself and Milton H. Clark, same place.
112,784.—EGG AND FRUIT-CARRIER.—Wm. J. Clark, Lena, Ill.
112,785.—LAPPET-LOOM.—Joseph Clough and J. Crompton, Chicopee, Mass.

2,786.—COATING GAS AND WATER-PIPE.—Nicholas Clute, Schenectady, N. Y.
112,787.—BLOTTING-PAD.—Alfred Q. Collins, Cambridge, Mass.
112,788.—SAWING-MACHINE TABLE.—Jonathan Creager, Cincinnati, Ohio.
112,789.—FIRE-SHOVEL.—I. W. Denning, Allegheny City, Pa.
112,790.—WASHING-MACHINE.—William J. Dodge, Syracuse, N. Y., assignor to himself, Alanson T. Briggs and William Henry Thrall, New York City.
112,791.—BLIND-WIRING MACHINE.—Elijah J. Dunaway, Cincinnati, Ohio.
112,792.—BALANCING VERTICAL-RECIPROCATING MASSES.—W. F. Durfee, Bridgeport, Conn., assignor to himself and Jackson & Wiley, Detroit, Mass.
112,793.—ADJUSTABLE BEVEL.—Willard C. Ellis, Springfield, Mass., assignor of one-half his right to Rufus A. Russell, same place.
112,794.—SAWING-MACHINE.—Jacob Felton, Fairmount, Ind.
112,795, antedated March 10, 1871.—MAGAZINE FIRE-ARM.—H. K. Forbis, Danville, Ky.
112,796.—CHURN.—David Frankfoder, Wakarusa, Ind.
112,797.—HORSE-COLLAR PAD.—John Fraser, Dowagiac, Mich., assignor to himself and John J. Hardy, same place.
112,798.—TELEGRAPH-SWITCH.—A. H. Freeman, Chicago, Ill.
112,799.—BIT-BRACE.—Raymond French, Seymour, Conn.
112,800.—LOOP FOR STIRRUPS.—Josiah B. Gathright, Louisville, Ky.
112,801.—VISE FOR JOINER'S USE.—J. Good, Lancaster, Pa.
112,802.—MACHINE FOR SEWING BOOTS AND SHOES.—Charles Goodyear, Jr., New Rochelle, N. Y.
112,803.—BREECH-LOADING FIRE-ARMS.—Gardner B. Gray and Joseph H. Romans, Mount Vernon, Ohio.
112,804.—COMBINED ORE-CRUSHER AND AMALGAMATOR.—Lyman Griswold, Denver, Colorado Territory.
112,805.—RAILWAY-RAIL CHAIR.—S. M. Guest, Ypsilanti, Mich.
112,806.—CHURN.—Heman S. Gurney and Horace Merrill, Memphis, Mich.
112,807.—MOUSE AND ANIMAL TRAP.—George L. Hart, New Britain, Conn.
112,808.—APPARATUS FOR CUTTING THE ENDS OF CIGARS.—M. J. Hinden, Detroit, Mich., arsignor to Adolph Freund, same place.
112,809.—SAND-SCREEN.—S. Holdsworth, Maspeth, N. Y.
112,810.—CORD-GUIDE FOR SEWING-MACHINES.—Henry Horn, Milwaukee, Wis., assignor to John O. Fairbairn, same place.
112,811.—THILL-COUPLING.—B. F. Horton, Ithica, N. Y.
112,812.—SASH-HOLDER.—P. B. Hovey, New London, Conn.
112,813.—BEE-HIVE.—Washington J. Kelly, Commerce, Mich.
112,814.—CURTAIN-FIXTURES.—William C. Kennedy, Commerce, Mich.
112,815.—CLOTHES-WRINGER.—Alex. King, Philadelphia, Pa.
112,816.—DRAWER-PULL.—Joseph Kintz, West Meriden, Conn., assignor to himself and P. J. Clark, same place.
112,817.—SHAFT-COUPLING.—Darius Knickerbocker and Samuel Knickerbocker, Allegan, Mich.
112,818.—RECTIFYING HIGH-WINES.—Archibald K. Lee, Galveston, Texas.
112,819.—PHYSICIAN'S SADDLE-BAG.—Andrew M. Leslie, St. Louis, Mo.
112,820.—WASH-BOARD.—Charles Letterman, Syracuse, N. Y., assignor to John W. Throop.
112,821.—PLANING-MACHINE.—C. Levey, Toronto, Canada.
112,822.—COTTON-PRESS.—Eli W. Long and Isaac N. Patten, Memphis, Tenn.
112,823.—TOY-PUZZLE.—Samuel Loyd, New York, N. Y.
112,824.—BOILER FOR HEATING PURPOSES.—James A. Maynard, Newtonville, Mass.
112,825, antedated March 2, 1871.—HYDRANT.—John McCann, Albany, N. Y.
112,826.—RAILWAY SHIFTING-TRUCK.—Patrick H. McWilliams, Detroit, Mich.
112,827.—PLATEN FEED-GUIDE.—Edward L. Megrill, Brooklyn, N. Y.
112,828.—MANUFACTURE OF IRON AND STEEL.—John W. Middleton, Philadelphia, Pa.
112,829.—CRANE.—John W. Middleton, Philadelphia, Pa.
112,830.—PEAT-MACHINE.—Hermann Mielisch, Racine, Wis.
112,831.—APPARATUS FOR REFINING METALS.—A. Millochau, New York, N. Y.
112,832, antedated March 14, 1871.—APPARATUS FOR REMOVING PAINT, VARNISH, &c.
112,833.—SASH-HOLDER.—James B. Morgan, Davenport, Iowa, assignor to himself and Maurice J. Keating, Rock Island, Ill.
112,834.—WAGON-SEAT.—Valentine Myers, Cogan Station, Pa., assignor to himself and John M. Phelps, same place.
112,835.—ROAD-SCRAPER.—Wm. T. Nichols, Chicago, Ill.
112,836.—TELEGRAPH-APPARATUS.—Henry C. Nicholson, Mount Washington, Ohio.
112,837.—SWEEPING-MACHINE.—George S. Norris, Baltimore, Md.
112,838.—MACHINE FOR GRINDING SAW-TEETH.—John L. Otis, Leeds, Mass.
112,839.—PREPARING TIN SALTS FROM TINNERS' WASTE.—A. Ott, New York, N. Y., assignor to New York Metal and Chemical Manufacturing Company, same place.
112,840.—SHUTTER-FASTENER.—Charles Pabst, Wilmington, Delaware.
112,841.—ELECTRO-MAGNETIC MOTOR.—H. M. Paine, Newark, N. J., assignor to M. S. Frost, New York city.
112,842.—BIT AND DRILL-BRACE.—George G. Parker and W. P. Dodge, Prospect, N. Y.
112,843.—GATE.—Noah Parker, Trimble county, Ky.
112,844.—ANIMAL-TRAP.—James D. Pell, New York, N. Y.
112,845.—PREPARING SEED-CORN.—John Meek Petit, Monroe township, Ohio.
112,846.—BROILER.—Edward B. Phelps and James P. McLean, Brooklyn, N. Y.
112,847.—LUBRICATOR.—Tapping Reeves, Little River, Cal.
112,848.—MANUFACTURE OF NITRO-GLYCERINE.—Edward A. L. Roberts, Titusville, Pa.
112,849.—MANUFACTURE OF NITRO-GLYCERINE.—Edward A. L. Roberts, Titusville, Pa.
112,850.—ELECTRIC AND OTHER FUSE-HEADS.—E. A. L. Roberts, Titusville, Pa.
112,851.—"CHAFE-IRONS" FOR WHEELED VEHICLES.—Edward P. Roche, Bath, Me.
112,852.—WINE-BASKET.—Jean Rouissillon, Epernay, France.
112,823.—STEAM-ENGINE.—Stephen P. Ruggles, Boston, Mass.
112,854, antedated March 10, 1871.—HOLSE HAY-RAKE.—John H. Schoonmaker, Bethlehem, assignor to himself and Alexander Selkirk, Albany, N. Y.
112,855.—HOISTING-MACHINE.—John Scott, Pontiac, Mich.
112,856.—HOISTING-MACHINE.—William Sellers, Philadelphia, Pa.
112,857.—BUCKLE FOR SUSPENDERS.—Abraham Shenfield, New York, N. Y.
112,858.—COMPOUND FOR TREATING CATARRH, &c., BY INHALATION.—Dana Slade, Chicago, Ill.
112,859, antedated March 7, 1871.—ELECTRIC-FUSE.—Henry J. Smith, Boston, Mass.
112,860.—HAND-TOOL FOR CARVING AND ENGRAVING.—George B. Soley, Philadelphia, Pa.
112,861.—GAUGE FOR SAW-TABLES.—F. L. Sprague, Keene, N. H., assignor to William H. Doane, Cincinnati, Ohio.
112,862.—CULTIVATOR.—William D. Stroud, Oshkosh, Wis.
112,863.—DAMPER.—Leonard S. Taylor, Sigel, Mo.
112,864.—STUMP-EXTRACTOR.—Albert D. Tilyou, Norwich, assignor to Cornelius A. Church, New Berlin, N. Y.
112,865.—BRAKE FOR RAILWAY-CARS.—Lewis W. Tracy, New York, N. Y., assignor to himself and James E. Granniss, same place.
112,866.—TUYERE.—Eben Trasy, Vermontville, Mich.
112,867.—ROLL FOR THE MANUFACTURE OF PLANTERS' HOES.—J. T. Tyler, Pittsburg, Pa.
112,868.—MACHINE FOR COILING BED-SPRINGS.—M. Van Vleck, Albany, N. Y.
112,869.—COMBINED HARROW, SEEDER AND ROLLER.—J. Vessot, Sr., and Samuel Vessot, Jr., Joliette, Canada.
112,870.—COMBINED POTATO-PLANTER AND DIGGER.—J. Carroll Walker, Farmington, Mich.
112,871.—HAND-STAMP.—John Walters, Norfolk, Va., assignor to William O. Hickok, Harrisburg, Pa.
112,872.—VEGETABLE-GRATER.—Jacob Wehrle and William Wittlinger, Cincinnati, Ohio.
112,873.—MACHINE FOR GRINDING CARRIAGE-SPRINGS.—Hebron M. Wentworth, Gardiner, Me.
112,874, antedated March 16, 1871.—FINISHING PAPER-BOXES.—Seth Wheeler and Edgar Jerome, Albany, N. Y.
112,875.—BARREL.—H. Willard, Grand Rapids, Mich.
112,876.—WINDOW-CURTAIN FIXTURE.—T. C. Williams, East Randolph, Wis.
112,877.—GLASS FOR THE MANUFACTURE OF SPECTACLES.—Thos. A. Wilson, Reading, Pa.
112,878.—BOLSTER-BLOCK AND PIER OR ABUTMENT PLATE FOR BRIDGES AND ROOF-TRUSSES.—J. M. Wilson, Philadelphia, Pa.
112,879.—COMPOSITION FOR STAINING WOOD.—J. Winger, Kansas City, Mo.
112,880.—MECHANISM FOR MANUFACTURING HEADS FOR PICTURE NAILS.—L. Wolf, Meriden, Conn., assignor to the Meriden Malleable Iron Company, same place.
112,881.—STEAM-HEATER.—Charles B. Wood, Baltimore, Md.
112,882.—RUFFLING ATTACHMENT FOR SEWING-MACHINES.—F. B. Zay, Findlay, Ohio.
112,883, antedated March 10, 1871.—SAW-MILL.—E. Andrews, Williamsport, Pa.
112,884.—CLOTHES WRINGER.—A. M. Bailey, Middlefield, Conn., assignor to "The Metropolitan Washing Machine Company," same place.
112,885.—ROCK-DRILL.—A. Ball, Claremont, N. H., assignor to Sullivan Machine Company, same place.
112,886.—SASH-HOLDER.—William T. Bausmith, Aberdeen, Md.
112,887.—IRON-RAILING.—Samuel S. Bent, Port Chester, N. Y.
112,888.—CLEVIS-HOOK FOR DOUBLE-TREES.—W. W. Bently, Lee township, Mich.
112,889.—ATTACHMENT FOR HARNESS.—William A. Blundell, St. Louis, Mo., assignor to himself, William P. Nelson and Mathew C. Tully.
112,890.—ADVERTISING-LAMP.—Emil Boesch, San Francisco, Cal.
112,891.—WHIP-STICK.—John J. Bohler, Westfield, Mass.
112,892.—MOWING-MACHINE.—Aaron Bolander, Akron, Ohio.
112,893.—PORTABLE-RAILWAY.—Theodore Bootsmann, Tompkinsville, N. Y.
112,894.—CORN-PLANTER.—Richard A. Boulware, Donipham, Kansas.
112,895.—DEVICE FOR OPENING OYSTERS.—Michael C. Boyer, Norristown, Pa.
112,896.—APPARATUS FOR TEMPERING SAND.—John C. Broadmeadow, Bridgeport, Conn.
112,897.—RAILWAY-CAR TRUCK.—Chauncey S. Buck, St. Louis, Mo., assignor to himself and James Lovett, same place.
112,898.—ROOFING-BRACKET.—Jonathan W. Cadwell, Springfield, Mass.
112,899.—VALVE-GEAR FOR STEAM-ENGINES.—A. S. Cameron, New York, N. Y.
112,900.—STILL.—James A. Campbell, Dayton, Va., assignor to himself, Abraham K. Layman, and Lewis W. Myers.
112,901.—THREAD-GUIDE FOR WINDING-MACHINES.—Dwight M. Church, Holyoke, Mass.
112,902.—SHOEMAKERS' HAMMER.—Arthur Clarke, Boston, Mass.
112,903.—DOOR-BELL.—J. P. Connell, Kensington, Conn.
112,904.—GATE.—Peter S. Crawford, Union, Ill.
112,905.—CARRIAGE-GEARING.—Cornelius Custer, Norristown, Pa.
112,906.—HARNESS-ROSETTE.—Walter D. Davis, Charles W. Blakeslee, and Joseph C. Peck, Watertown, Conn.
112,907.—CALL-BELL.—Henry A. Dierkes and John Fretts, New York, N. Y.; John Fretts assigns his right to Henry A. Dierkes.
112,908.—CIRCULAR-SAW BENCH.—Benn F. Dunklee, Concord, N. H.
112,909.—ADJUSTABLE MILL-FEED.—William T. Duvall, Georgetown, D. C
112,910.—LOCKED-COCK.—Henry Essex, Meadville, Pa.
112,911.—SAND-SCREEN.—George W. Fair, Dayton, Ohio.
112,912.—BED-BOTTOM.—Matthew Faloon, Bloomington, Ill.
112,913.—PLOW.—Lawrence F. Frazee, Jersey City, N. J.
112,914.—TUYERE FOR BLAST-FURNACES.—John Fry, Salisbury, Conn.
112,915.—CENTER-POINT TRIMMING.—Ansel Hecht, New York, N. Y.
112,916.—CULINARY-VESSEL.—Levi Hermance, Lansingburg, N. Y., assignor of one-half his right to Peletiah J. Marsh, same place.
112,917.—PENCIL-CASE.—William S. Hicks, New York, N. Y.
112,918, antedated March 10, 1871.—ORE-SEPARATOR.—William Hooper, Ticonderoga, N. Y.
112,919, antedated March 10, 1871.—ORE-SEPARATOR.—William Hooper, Ticonderoga, N. Y.
112,920.—MEDICAL COMPOUND OR SALVE.—Martha Huddleston, Jackson, Tenn.
112,921.—FAN AND FLY-DRIVER.—Frank M. Hunt, Clinton, Ga.
112,922.—CATTLE-TIE.—Seth T. Hutchins, North Anson, Me.
112,924.—ROLLING-MILL.—Asa Johnson, Brooklyn, N. Y., assignor to himself and Wm. H. Johnson, New York City.
112,925.—HOLLOW-TILE WALL.—George H. Johnson, New York, N. Y.

REISSUES.

4,305.—SEWING-MACHINE.—Chauncey O. Crosby, New Haven, assignor to N. A. Baldwin, Milford, Conn.—Patent No. 21,745, dated October 12, 1858.
4,306.—COPYING-PRESS.—E. W. Frost, New York, N. Y., assignee of Francis Hovey.—Patent No. 42,141, dated March 29, 1864.
4,307.—SEED-DRILL.—Frederick H. Manny, Rockford, Ill., assignee of Moses C. Younglove.—Patent No. 20,693, dated June 15, 1858.

DESIGNS.

4,721.—CARPET-PATTERN.—Jonathan Crabtree, Philadelphia, Pa., assignor to Leedom, Shaw & Stewart, same place.
4,722.—ORNAMENTAL CHAIN-LINK.—Virgil Draper, Attleborough, Mass., assignor to Oscar M. Draper, same place.
4,723.—CHAIN-LINK.—Virgil Draper, Attleborough, Mass., assignor to Oscar M. Draper, same place.
4,724.—SHOW-CASE.—William Henry Grove, Philadelphia, Pa.
4,725.—SIDE-FRAME OF SCHOOL-DESKS.—Ausborn Franklin Old, Philadelphia, Pa., assignor to J. A. Bancroft & Co., same place.
4,726.—TYPE.—William H. Page, Norwich, Conn., assignor to William H. Page & Co., same place.
4,727.—TYPE.—William H. Page, Norwich, Conn., assignor to William H. Page & Co., same place.
4,728.—TYPE-BORDER.—William H. Page, Norwich, Conn., assignor to William H. Page & Co., same place.
4,729.—WHISK BROOM.—Greenleaf Stackpole, Elizabeth, N. J.
4,730.—SWORD.—Edwin S. Warren, Springfield, Mass.
4,731.—HANDLE FOR SPOONS OR FORKS.—George Wilkinson, Providence, R. I., assignor to Gorham Manufacturing Company, same place.

TRADE-MARKS.

197.—PLUMBAGO GREASE.—American Graphite Company, New York, N. Y.
198.—PUMP.—Charles G. Blatchley, Philadelphia, Pa.
199.—WOOLEN GOODS.—William P. Gibbs, Reuben G. Ross, Isaac N. Field, and William B. Field, St. Charles City, Mo.
200.—WEIGHING SCALE.—Edward F. Jones, Binghamton, N. Y.
201.—WHISKY.—Mills, Johnson & Co., Cincinnati, Ohio.
202.—SHIRT—Morison, Son & Hutchinson, New York, N. Y.
203.—TOBACCO.—Edmund J. Oppelt, Baltimore, Md.
204.—BURNING-FLUID.—Robert G. Richards, New York, N. Y.
205.—SLATES, &c.—The Silicate Slate Company, N. Y.
206.—WINE.—M. Werk & Sons. Cincinnati, Ohio.

EXTENSIONS.

SAMUEL REYNOLDS, of Ellisburg, N. Y.—Letters Patent No. 16,881, dated March 24, 1857.
THEOPHILUS E. SICKELS, of Omaha, Neb.—Letters Patent No. 16,884, dated March 24, 1857.

IMPORTANT TO INVENTORS.

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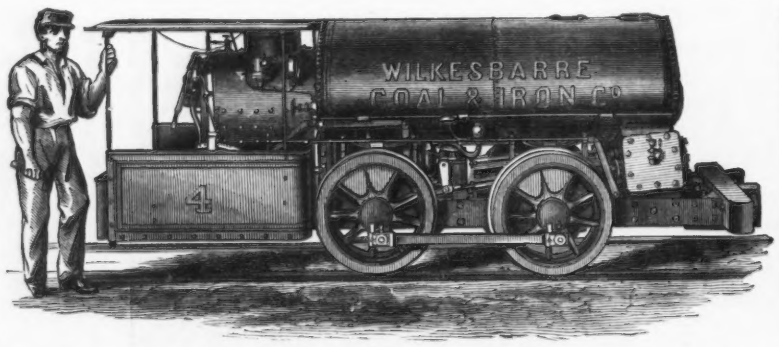
OXIDE OF ZINC, SPELTER, SHEET ZINC.
Jun28:1y



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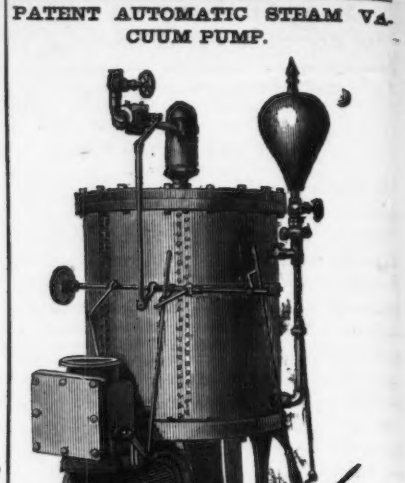

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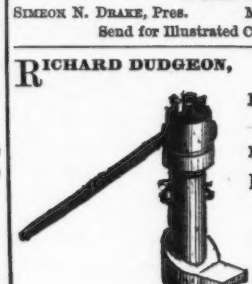

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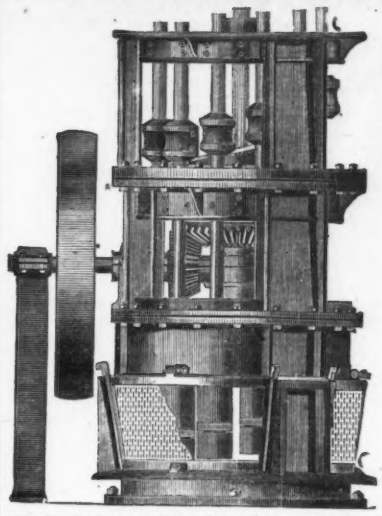

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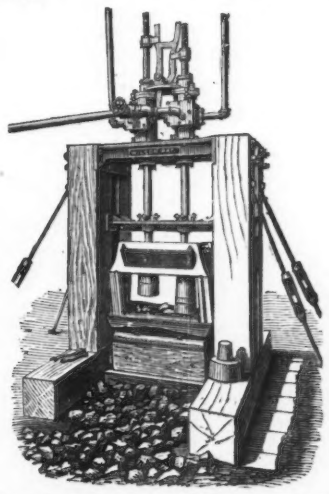

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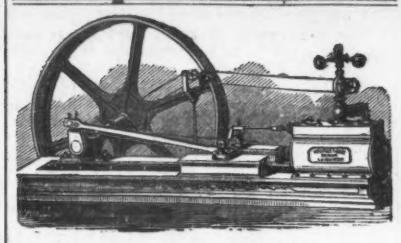

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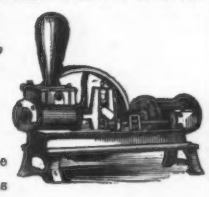

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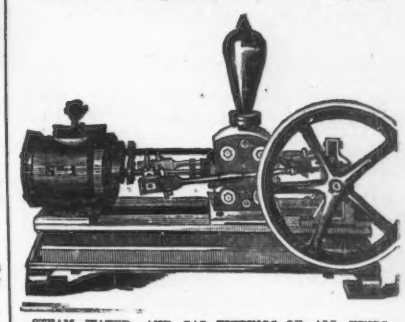

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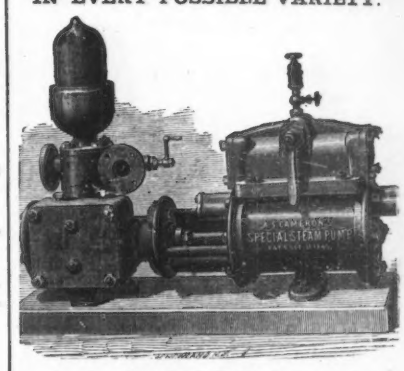

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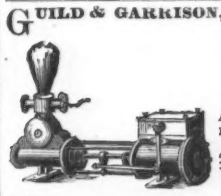

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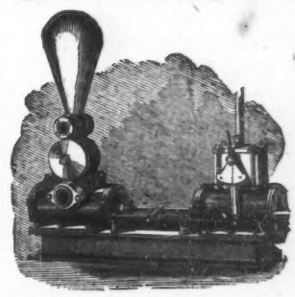

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	FROM MABIE, TODD & CO.			
31	Gold Pen and Pencil, rubber case	8 00	15	45
32	Gold Pen and Pencil, rubber case	6 75	13	37
33	Gold Pen, silver or gold holder, in box	4 25	9	32
34	Gold Pen, extension gold case, in box	20 00	29	90
35	Lady's Gold Pen, ivory holder, in box	2 75	6	25
	FROM HENRY RUSSELL & CO.			
36	Downer Mineral Oil Lamp, No. 1956	4 75	10	35
37	Downer Mineral Oil Lamp, No. 1950	9 25	17	56
	FROM C. F. A. HEINRICH.			
38	St. Germain Student Lamp, largest size	8 25	15	45
	FROM FAIRBANKS & CO.			
39	Family Scales	14 00	21	70
	FROM COLBY BROS. & CO.			
40	Clothes-Wringer	7 50	10	35
	FROM ALEXANDER M. LESLEY.			
41	Refrigerator, the Zero, No. 38	38 00	42	142
42	Cooler, the Newport, No. 1	12 00	15	45
43	Hot-Air Coal Furnace, the Gothic, No. 9	125 00	135	450
44	Hot-Air Wood Furnace, Gothic, No. 10	150 00	162	525
	FROM THE STANLEY RULE & LEVEL CO.			
45	Iron Smoothing-Plane, Bailey's patent	5 00	13	37
46	Iron Smoothing-Plane, Bailey's patent	6 50	14	42
47	Iron Jack-Plane, Bailey's patent	7 50	15	47
48	Iron Fore-Plane, Bailey's patent	9 00	17	55
49	Iron Jointer-Plane, Bailey's patent	10 00	18	58
50	Wood Smoothing-Plane, Bailey's patent	3 00	8	30
51	Wood Fore-plane, Bailey's patent	4 50	10	35
52	Wood Jointer-Plane, Bailey's patent	75	12	36
53	Wood Jointer-Plane, Bailey's patent	50	14	40
	FROM POST & GODDARD.			
54	Machinists' Hand-Taps	17 60	25	75
55	Machinists' Hand-Taps	52 80	65	220
56	Machinists' Hand-Taps (your choice)			
57	Screw-Plates and Dies, size A	5 00	12	37
58	Screw-Plates and Dies, size B 1	8 00	15	45
59	Screw-Plates and Dies, size C 1	10 00	18	58
60	Screw-Plates and Dies, size D 1	13 00	20	70
61	Tap-Wrenches, size A	3 00	7	25
62	Tap-Wrenches, size B	4 00	9	30
63	Tap-Wrenches, size C	5 00	12	37
64	Set of 11 Taper Shank-Twist Drills, No. 1	19 75	29	90
65	Set of 29 Drills, straight shank, mounted, No. 9	12 00	18	60
66	Set of 60 Drills, steel wire gauge from 1 to 60, No. 12	8 00	15	45
67	Set of 21 Taper-Shank Drills, No. 3	44 00	58	175
68	Set of 9 Bit-Stock Drills, 1-16 to ¾ in.	2 80	6	25
69	Self-Centering Drill-Chucks, Beach's patent, for jewelers, No. 0	10 00	18	58
70	Self-Centering Drill-Chucks, Beach's patent, for drilling, No. 0	7 00	14	40
71	Self-Centering Drill-Chucks, Beach's patent, 0 to 3-16, No. 1	6 00	13	38
72	Self-Centering Drill-Chucks, Beach's patent, 1 to 60 S. W. E., No. IX	7 00	14	40
73	Self-Centering Drill-Chucks, Beach's patent, 0 to ¼, No. 3.	14 00	23	77
74	Drill-Grinding Machine, No. 1	10 00	18	58
75	Drill-Grinding Machine, No. 2	20 00	30	95
76	Auger-Bits, your choice of 4 sets	—	—	—
	FROM L. W. POND.			
77	Foot-Lathe, No. 1	50 00	65	204
78	Foot-Lathe, No. 2	30 90	47	124
	FROM COLBY BROS. & CO.			
79	Miniature Steam-Engine and Boiler	1 36	5	23
	FROM RUSSELL & ERIER.			
80	Steam-Engine (1 H. P.) and Boiler	300 00	310	1125
81	Steam-Engine (3 H. P.) and Boiler	600 00	640	3250
82	Steam-Engine (5 H. P.) and Boiler	800 00	858	3000
83	Steam-Engine (10 H. P.) and Boiler	1200 00	1285	4500
84	Steam-Pump, C. B. Hardick's, No. 0	120 00	155	540
85	Steam-Pump, Cameron & Co.'s, No. 1	150 00	192	675
86	Steam-Pump, Cameron & Co.'s, No. 2	200 00	257	900
87	American Submerged Pump	12 00	19	65
	FROM GEORGE TALLCOT.			
88	Turbine Water-Wheel, Reynold's, 12 in.	105 00	125	360
89	Turbine Water-Wheel, Reynold's, 24 in.	226 50	270	800
90	Turbine Water-Wheel, Reynold's, 36 in.	384 50	460	1350
91	Rotary Blower, Root's patent, No. 1	$50 00	70	275
92	Rotary Blower, Root's patent, No. 2	80 00	105	420
93	Portable Forge, Root's patent, No. 1	48 00	65	260
94	Portable Forge, Root's patent, No. 3	80 00	105	420
	FROM THE AMERICAN SAW CO.			
95	Circular Saw	125 00	135	473
96	Cross-Cut Saw	6 00	14	42
	FROM A. P. & M. STEPHENS.			
97	Labor-Saving Vise, 2-in. jaw	4 00	9	32
98	Labor-Saving Vise, 4½-in. jaw	12 00	28	58
	FROM THE STANLEY RULE & LEVEL CO.			
99	Boxwood two-foot Rule	2 50	6	25
100	Silver-Plated Triangular Drawing-Scale	6 00	16	52
101	Pocket Sheet-Metal Gauge	5 00	13	37
102	Arkansas Oil-Stone	1 75	5	22
103	Arkansas Oil-Stone, mahogany case	*3 25	8	30
104	Gear or Cog-Wheel Calculating-Rule	4 00	12	36
	WESTERN & COMPANY'S AGENCY.			
105	Preparing and Filing a Caveat	25 00	28	80
106	Application for a Patent	30to40	35	100
107	Application for Patent and first Government fee	46to56	50	150
108	Application for Patent and all Government fees	66to76	75	250
	FROM J. W. HUTCHINSON.			
109	English Breech-loading double-barrel Gun	100 00	110	350
110	English Muzzle-loading double-barrel Gun	75 00	85	250
111	Breech-loading Rifle, the Allen	30 00	46	150
112	Revolver, Smith & Wesson's, No. 1½	12 50	19	65
113	Revolver, Smith & Wesson's, No. 2	15 00	22	75
	FROM MASON & HAMLIN.			
114	Melodeon, portable, No. 1, 4 octave	50 00	66	200
115	Melodeon, resonant, style G, 5 octave	170 00	146	510
116	Pipe-Organ, church use, style No. 29	675 00	579	2000
	FROM J. S. & C. ODELL.			
117	Pipe-Organ	500 00	430	1500
118	Pipe-Organ	700 00	600	2100
119	Bradbury Square Piano-Forte, No. 4	650 00	430	1500
120	Steinway's No. 1 Grand Piano	1200 00	860	3000
	THE AMERICAN WATCH CO., WALTHAM, MASS.			
121	Silver Watch	20 00	32	100
122	Silver Watch	35 50	48	142
123	Gold Watch	50 00	65	200
124	Lady's Gold Watch	100 00	110	350
	FROM THE UNITED STATES WATCH CO.			
125	Silver Watch	40 00	50	150
126	Silver Watch	66 00	75	275
127	Gold Watch	100 00	100	300
128	Silver Watch	104 00	104	312
129	A Sewing Machine (your choice)	65 00	65	200
	FROM MCALLISTER.			
130	Microscope and 48 objects	10 00	14	40
	FROM COLBY BROS. & CO.			
131	Velocipede for Boys	16 00	16	52
	FROM MCALLISTER.			
132	Magic-Lantern, No. 433	20 00	30	95
	FROM H. THOMPSON.			
133	An Easy Chair			
	FROM D. APPLETON & CO.			
134	New American Cyclopædia, 16 vols.	80 00	80	213
	FROM G. & C. MERRIAM.			
135	Webster's Unabridged Pictorial Dictionary	12 00	15	45
136	Webster's National Pictorial Dictionary	6 00	10	35
	FROM WESTERN & COMPANY.			
137	One back vol. Manufacturer and Builder, unbound, post-paid	1 75	6	25
138	Two back volumes Manufacturer and Builder, unbound, post-paid	3 50	11	37
139	One back vol. Manufacturer and Builder, bound, post-paid	2 50	9	32
140	Two back volumes Manufacturer and Builder, bound, post-paid	5 00	18	58
141	Cover for binding the Manufacturer and Builder, post-paid	60	3	21
142	A $10 Library (your choice from list in special sheet), *All paid through by mail or express.*	10 00	18	58
143	A $15 Library, "	15 00	24	85
144	A $20 Library, "	20 00	31	106
145	A $25 Library, "	25 00	38	125
146	A $30 Library, "	30 00	44	144
147	A $35 Library, "	35 00	50	162
148	A $40 Library, "	40 00	56	177
149	A $45 Library, "	45 00	62	192
150	A $50 Library, "	50 00	68	207
151	A $60 Library, "	60 00	80	237
152	A $75 Library, "	75 00	100	282
153	A $100 Library, "	100 00	125	360
154	A choice of good Books (see terms in another column)			
155	A choice of convenient Book-Cases (see special sheet)			
156	A choice of popular Music (see terms in special sheet)			
157	A choice of Games and Toys, (see terms in special sheet)			

We have taken especial pains to select in making up our price list the NEWEST and very BEST articles. No charge will be made for boxing or packing any article on our list. The premiums, Nos. **4** to **7** inclusive, **31** to **35** inclusive, **75** to **99**, **101**, **105** to **108** inclusive, **121** to **128** inclusive, **137** to **141** inclusive, **154**, **156**, **157**, will each be delivered FREE of charge by mail or express (at the Post-office or express office nearest recipient) to any place in the United States or Territories. The other articles cost the recipient only the freight after leaving the manufactory of each, by any conveyance specified.

As an aid to those who engage upon large clubs, we will count subscriptions by *one* individual for 1869, 1870, and 1871, as *three* subscribers toward a premium. Every *new* subscriber should have the work from the beginning. Bound volumes may be counted in the same way—each as one subscriber—except, of course, when they are obtained as a premium.

Do not fail to note the followipg Points:

1. All subscribers sent by one person count, though from one or a dozen different post-offices. But

2. State with each name or list of names sent that it is for a premium.

3. Send the names as fast as obtained, that the subscribers may begin to receive the paper at once. You can have any time, from one to six months, to fill up your list.

4. Send the exact money with each list of names, so that there may be no confusion of money accounts.

5. Old and new subscribers all count in premium clubs, but a portion, at least, should be new names; it is partly to get these that we offer premiums to canvassers.

6. Specimen numbers, cards, and show-bills will be supplied free, as needed by canvassers; but they should be used carefully and economically, as they are very costly.

7. Remit money in Checks on New York banks or bankers, payable to order of WESTERN & COMPANY, or send Post-Office Money Orders. If neither of these is obtainable, Register Money Letters, affixing stamps both for the postage and registry; put in the money and seal the letter in the presence of the postmaster, and take his receipt for it. Money sent in any of the above ways is at our risk.

DESCRIPTIVE LIST OF PREMIUMS.

Every Premium in the annexed list is described in the December MANUFACTURER AND BUILDER, *and also in a* **Special Descriptive Sheet,** *which will be sent* **free** *to every one desiring it. We have room here for the following only:*

No. 1—Chest of Good Tools.—We are able, through the special favor of Messrs. Patterson Brothers, of 27 Park Row, to offer chests of the very finest quality of tools, of kinds and prices named below. Similar tools could be purchased for half the money; but these are all A No. 1, for practical use, and worth a dozen common articles. For this we have the guarantee of Messrs. Patterson, which is amply sufficient for us, and for all who know them. Any of these tools may be ordered of them. We make up only a single premium, which contains a full assortment for all common purposes. The tools are of regular size, and but few additions would be required for a journeyman carpenter. The assortment we offer is as follows: 1 tool-chest, $8; 1 jack-plane, $1 75; 1 smooth-plane, $1 50; 1 fore-plane, $2 25; 1 handsaw, 22 in., $1 75; 1 compass saw, 10 in., 50c.; compass, 6 in., 37c.; 1 adze-eye hammer, No. 4, $1 25; 1 hatchet, No. 2, 90c.; 1 draw-knife, 7 in., $1 12; 1 try-square, 6 in., 70c.; 1 bevel, 8 in., 75c.; 1 chalk-line and spool, 30c.; 1 mallet, 30c.; 1 pair of pliers, (steel,) 5 in., 60c.; 1 pair of calipers, 4 in., 38c.; 1 brace, No. 2, $2 25; 1 auger-bit, ea., ¼ in., 30c.; ⅜ in., 32c.; ½ in., 45c.; 1 in., 60c.; 1 centre-bit, ea., ½ in., 21c.; ¾ in., 23c.; 1 in., 25c.; 1¼ in., 35c.; 1½ in., 40c.; 6 gimlet-bits, assorted, 90c.; 3 gimlet-bits, assorted, 33c.; 1 screw-driver bit, 25c.; 1 flat countersink, 25c.; rose, do., 25c.; snail, do,, 25c.; 1 octagon reamer, 30c.; 1 taper-bit, 30c.; 1 screw-driver in handle, ea., 3 in., 30c.; 6 in., 50c.; 1 gouge in handle, ea., ½ in., 50c.; 1 in., 70c.; 1 chisel in handle, ea., ¼ in., 30c.; ½ in., 35c.; ¾ in., 40c.; 1 in, 50c.; 1¼ in., 60c.; 1 framing-chisel, ea., ¾ in., $1; 1 in., $1 10; 1¼ in., $1 20; 1 auger, ea., ¾ in, 70c.; 1 in., 80c.; 1¼ in., 90c.; 1 set brad-awls in handles, $1 35; 1 rule, 2 feet, 25c.; 1 saw file, ea., 4 in., 14c.; 5 in., 17c.; 1 flat bastard file, 8 in., 30c.; 1 wood-rasp, 50c.; 1 soldering copper, 60c; solder nails, etc., $1 25 = **$45 00.**

Nos. 2, 3—Mathematical Instruments for Draughting, Drawing, Etc.—Very convenient not only for architects and mechanics, but for boys and girls. These are neatly fitted in beautiful rose-wood cases, having dividers with flexible joints, and points, semi-circles, pencil and penholders, rulers, etc., etc. All the pieces in No. 2 are finished in brass and steel; those in No. 3 are German-silver and steel. The pieces are the same in each, but No. 3 is of extra beauty and workmanship. 18 subscribers at $1 50 each secures No. 2, and 22 at $1 50 each, No. 3.

Nos. 4, 5, 6, 7—Pocket Knives.—Here's for the boys and girls. These premiums are among the most pleasing and useful that we have ever offered. Every boy, and girl too, wants a pocket knife. We give them an opportunity to obtain a most valuable one for merely a little effort. These knives are from Messrs. Patterson Bros. No. 4 is a neat, substantial knife, with three blades and buck-horn handle. No. 5 is a still finer article, with four blades and buck-horn handle. No. 6 is an elegant knife, with four blades and shell handle. No. 7 is a lady's pocket-knife, a beautiful article, with four blades and shell handle.

Nos. 8, 9, 10, 11, 12, 13—American Table Cutlery.—We are glad to be able to offer really good articles of American manufacture, such as are competing successfully with the best foreign goods. ***Messrs. Patterson Bros., 27 Park Row,*** who supply us with these articles, are also importers of English goods. They recommend these knives, manufactured by the ***Meriden Cutlery Co.,*** as equal to any cutlery in the market, and their recommendation is a guarantee wherever they are known. We offer four kinds of knives, and three sizes of each kind. No. 8 have rubber handles, which are actually boiling-water-proof, so that, if they were accidentally to remain in it for several minutes, or even hours, they would not be injured. The blades are of the best steel, and warranted. Dessert size, with forks, sold at $14. For 23 subscribers at $1 50, or 78 at $1, we will give either the medium size or the table size, sold at $15 50. No. 9 have ivory handles, are selected with great care, have steel blades, and are beautiful goods. Dessert size, with forks, sold at $18 50. For 31 subscribers, at $1 50, or 100 at $1, we will send the medium size, sold at $20 50. For 34 at $1 50, or 112 at $1, we will send the table size, sold at $22 50. No. 10 are made of solid steel, and are triple plated all over with pure silver, which will wear for a long time, while the knife is actually indestructible by ordinary use. Dessert size, with forks, sold at $22. For 37 subscribers, at $1 50, or 118 at $1, we will give the medium size, sold at $24 50. For 38 at $1 50, or 120 at $1, we will send the table size, sold at $25. For 38 at $1 50, or 120 at $1, we will send the table size, sold at $25. No. 11 have steel blades, triple-plated with silver, and larger ivory handles, and are really splendid goods. Dessert size, with forks, sold at $25 50. For 42 subscribers, at $1 50, or 128 at $1, we will give the medium size, sold at $28. For 45 subscribers at $1 50, or 143 at $1, we will give the table size sold at $30 50. The forks, which accompany these premiums, Nos. 8, 9, 10, are made of genuine albata, and warranted double-plated with coin-silver. The forks with No. 11 are warranted triple-plated with coin-silver. These forks are also furnished to us by Messrs. Patterson Bros. The carving-knife and fork, and fluted steel, are made by

PUBLICATIONS.

the Meriden Cutlery Co., with the best ivory balanced handles.

Nos. 14 to 29—Silverware for the Table.—What would become of elegance and refinement in the furnishing of homes if the ladies (God bless them!) had not such an amiable passion for endlessly beautifying everything around them? Ever since Eve first set out the fruit of Paradise on its broad leaves to entertain the angel guests of Adam, it has been the province of her lovely daughters to spread the social board with attractions still more tempting to the eye than to the palate. What, that becomes a woman, will not a woman do to make her table shine? We condole with them that their means are not always equal to their good taste, and propose that henceforth no lady shall lack a lustrous silver tea-set, or other piece of similar elegance, unless she chooses to. Look at the following premiums, all of the celebrated manufacture of Messrs, HALL, ELTON, & Co., 36 Park Row, New York; No. 28 is silver-plated, gold-lined, beautifully chased **Tea Set** of six pieces, consisting of a coffee-pot, two teapots, a creamer, a sugar-bowl, and a slop-bowl. The style of this set is very neat, new and elegant. Messrs. Hall, Elton & Co, warrant these goods to be their best triple plate. This is a very desirable premium. No. 29 is a tea-set with same number of pieces, triple-plated, plain, new style.

Nos. 31, 32, 33, 34, 35—GOLD PENS. Rubber Mounted with Ever-Pointed Pencils—Pens in Gold and Silver Holders—Pens and Pencils in Extension Cases.—No. 31 has a gold-mounted rubber case, with pencil, and a No. 4 gold pen, manufactured by MABIE, TODD & Co., 180 Broadway, New York. This and the next, No. 32, are, we think, really the best things of the kind manufactured. The fact that hard rubber is used, shows that the gold for the mountings, etc., is of the finest quality, as rubber, on account of the sulphur contained in it, can not be mounted with any other without tarnishing. When closed, the pencil No. 31 is only 5 inches long, (No. 32, 3¼ inches,) but it opens to a length of 5¾ inches. The price for the holder and pencil of No. 31, is $6, pen $2; and of No. 32, or smaller size, $5 for the case, and $1 75 for the pen. Fifteen subscribers will give you the former, or gentleman's size, and 13 the latter, or lady's size. No. 33 is a No. 6 gold pen, with silver or gold-plated holder with an ebony handle—a very neat, desirable business pen By describing the kind of pen you prefer, we can probably select one that will suit your hand perfectly. We send these by mail, in a neat turkey morocco box, lined with velvet, in which they can be kept, protected from injury, No, 34. is a large pen, in a fine extension case, round or fluted, and richly engraved. The gold is 14 carats fine. These pens, which are nicely put up in boxes, are a very beautiful thing for a present. Price $20, and sent, postage paid, to any address, upon receipt of 29 subscribers at $1 50 each. No. 35 is a lady's gold pen, with ivory holder. Price, $2 75. This is indeed a very neat and beautiful pen for ladies' use We send it, postpaid, by mail, inclosed in a handsome velvet-lined morocco box, for 6 subscribers.

No. 38—The Celebrated St. Germain or German Student's Lamp.—as it is sometimes called. This lamp is made and furnished to us by C. F. A. HINRICHS. It scarcely needs eulogium, being the standard thing in our leading colleges, both among students and professors. They reject gas, even where it is most plentiful and convenient, and save their much-worked eyes by the motionless pure white light for which this lamp is so remarkable. No other artificial illumination approaches so nearly to the still colorless sunlight. The secret is in the scientific adaptation of burner and chimney to produce that perfection of draught by which absolute combustion is attained without vibration. The porcelain shade softens the light most agreeably. The lamp slides on a vertical standard, and is adjusted by a set-screw at any desirable elevation to accommodate the work or the eyes. The reservoir is elevated above and at a short distance from the burner, (communicating by a pipe,) so that the oil is always cool and out of reach of flame. The reservoir can be taken out of its telescopic socket, and carried away to another room and filled and returned, without putting out the light. The lamp will be a treasure worth no little trouble to obtain to any one who needs strong light, or who values eye-sight, economy, neatness, pure air, and freedom from trouble and annoyance with lamps; as in all these points it is without a peer. The price of these lamps is $8, with 25 cents for packing. The mineral sperm oil can be had from most respectable dealers, or ordered in packages of any size (1 gallon upward) from Messrs. HENRY RUSSELL & Co., 38 Park Place, New-York.

No. 39—Family Scales.—These scales combining the advantages of counter and platform scales, are peculiarly adapted to household purposes. They weigh from ¼ ounce to 240 lbs. They have a scoop or pan for weighing flour, sugar, and other house stores, and a platform for heavier articles, and are just such an apparatus as is needed for in-door or out-door use, occupying less than two feet square. These scales are manufactured by the well-known FAIRBANKS & Co., No. 252 Broadway New York, whose weighing apparatus has long ranked as the standard in all parts of the country. Send to them for circulars, if desired.

Nos. 45-53—Bailey's Patent Planes.—To those who have used these planes and know their value, it is but small praise to say that they are superior to any others made. They are so far ahead of any others that there can be no comparison between them. They are self-adjusting in every respect. Both the wood and iron planes are entirely independent in themselves, requiring neither hammer, screw-driver, nor wrench to replace or adjust the cutter, which is held firmly in place and can be instantly released by use of the cam and its thumb-piece. The cutter is adjusted by simply turning a thumb-screw under the bed-piece upon which the plane-iron rests. By this the cutter can be adjusted to any thickness of shaving. The Stanley Rule and Level Co., 55 Chambers Street, New York, warrant these planes to be of the best stock and finish. The various numbers and sizes of these planes which we offer give carpenters, mechanics, and others desiring them, an opportunity to get a complete set of either the wood or iron planes as premiums. The smooth planes, of which we offer two sizes, are 5½ inches long, 1¼ inch cutter; and 8 inches long, 1¾ inch cutter.

Jack plane..	14	in. long, 2	in. cutter.	Iron.
Fore "	18	" " 2⅜	" "	
Jointer "	22	" " 2⅜	" "	

In the wood planes the lengths and widths of cutter embrace all sizes made. Forty-four subscribers at $ .50 each, or 141 subscribers at $1 each, will get a complete set of the wood-planes. Sixty-nine subscribers at $1.50 will get a complete set of the iron planes, which will last a life-time. If larger sizes than those given are wanted, a few extra subscriptions will be required, according to the difference in the price.

Nos. 54-76—Machinists' Tools.—This series of premiums, consisting of machinists' tools, etc., has been selected and put up at the suggestion of several practical men with whom we have consulted in regard to the subject. These gentlemen, who have a practical knowledge of the tools, and of the requirements of all who have any thing to do with the working of metals, give their unqualified approval of the tools we have selected. This list of premiums has been made so extensive that every man who has any industrial operrtions to carry on will find some tool or tools absolutely necessary to him. By sending us clubs of subscribers to THE MANUFACTURER AND BUILDER these tools may be obtained by the smallest possible amount of labor. Of the qualities of these tools, in point of finish, we know them to be the best in the market—the best, without challenge. When a man has a set of any of them in his tool-chest, he knows he has the means of producing work equal to any that can be done. We obtain these tools from the general agents, Messrs. POST & GODDARD, 109 Liberty Street, New York.

No. 77—Foot-Lathe No. 1.—Of these useful articles we offer two kinds. No. 1 is perfectly adapted for most kinds of turning in wood or metals; also drilling, boring, polishing, sawing, etc. It seems to be the size desired by most people. This is proved by the great numbers of them sold. This lathe takes a place between centres 19 inches long and 6¼ inches wide in diameter. It weighs 200 pounds. It is fitted with two pointed centres, one spur-centre, face-plate turned and polished, two rests, one 9 and the other three inches long; also centre key and wrench combined, which fits the screw heads in different parts of the lathe. The balance-wheel weighs 45 pounds, is turned true, and is polished. It has two sizes for change of speed. This size of lathe has a great many extra parts made for it, so that whenever they are wanted they can be obtained. This is a very valuable point, as in buying other machines of the kinds only such things as happen to fit can be used, and they are not always to be found when wanted. The Rev. JOHN TODD, D.D., speaking of lathes, says in regard to these, "For price, for finish, for beauty and workmansip, I have never seen any American lathe so desirable. Of the No. 1 he says: "Nobody can own the lathe without daily gratitude." We procure these lathes through Mr. LUCIUS W. POND, 98 Liberty street, the well-known manufacturer of machinists' tools. Few people can obtain one of these lathes more easily than by obtaining 65 subscribers for THE MANUFACTURER AND BUILDER, for which we ship this premium, without any additional charge for boxing. The regular price is $50. We include leather belt 8 feet long, which costs 90 cents in the price given in the table.

No. 78—Foot Lathe, No. 2.—Our subscribers are frequently asking for second-hand lathes, saying at the same time that such a one would answer their purpose, and probably come cheaper. There are many others who do not care for so complete a lathe as No. 1. The No. 2, we think, will answer this demand. It is made of cheaper materials, but in the same style as lathe No. 1. The frame is of wood, with curved legs, which give it a neat and attractive appearance. It is painted and ornamented in the best style. The bed is made with iron slides three feet long. Will take a piece between centres 21 inchhes long and 6¼ inches in diameter. It has an iron pulley like No. 1. The spindle runs accurately. The face-plate takes off, and the centres are fitted to tapering sockets. Tailstock spindle traverses with a left-hand screw. Everything is well fitted and finished. The balance-whee is the same pattern as for lathe No. 1, and is turned true. The lathe, with face-plate, long and short T rests, two pointed centres, spur-centre, and wrench, packed for transportation, costs $30. For this we also include the leather belt, 8 feet long, which is used on the driving wheel. We box this lathe and deliver it on the cars for a club of 47 subscribers at $1 50 each, or 124 at $1. The twist-drills and chucks—premiums 65, 66, and 69 to 73—especially the smaller sizes, are just the things for these lathes. The chucks, No. Ox, 2 and 3, cost $2 extra for fitting in the lathe. Those desiring further information in regard to the premium may send to WESTERN & Co., 37 Park Row, New York, for an illustrated pamphlet.

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PATENTS—No. 76,499, April 7, 1868.. No. 96,465, Nov. 2, 1869.
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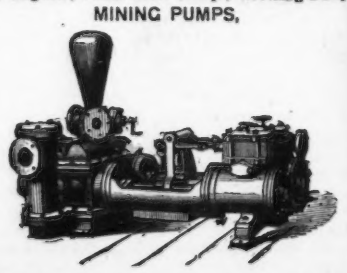

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